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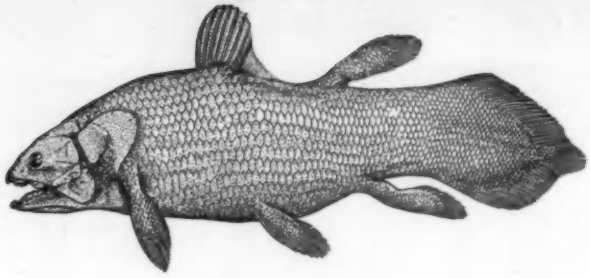

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Chemicals as Farming Tools

CHEMICALS are fast becoming as important to agriculture as the plow and hoe. Besides their time-honored use as fertilizers and insecticides, they are assuming a large place in farming operations as herbicides, fungicides, and soil fumigants, and for retaining and improving crop quality.

Federal and state agencies and private institutions are all conducting research, and progress has been most pronounced in weed control. As recently as 1945 very little use was made of herbicides in agriculture, but weed specialists estimate that last year farmers applied them to more than 30 million acres of cropland.

Current studies are concentrating on weed control in specific crops or under specific conditions. At the same time investigation of physiological effects and responses of plants from applications of chemicals is continuing. Particular attention is being given to time and method of application, such as pre-emergence herbicides, translocated herbicides, contact herbicides, and soil sterilants under specific conditions. Excellent control of weeds in cotton rows, for example, has been obtained by using pre-emergence applications of dinitro compounds, followed by postemergence applications of herbicidal oils. In one test last year this combination controlled in-the-row weeds at a cost of $6.55 compared with $14.00 per acre for hoeing.

The most important advance in fungicidal research has been the discovery that many complex organic materials, such as dithio carbamates, phenyl mercury compounds, and dichloro naphthoquinone, are effective fungicides. These chemicals—the result of a decade of close teamwork between the chemical industry and plant pathologists—are more specific in their action than the older fungicides and are often more effective. Copper and sulfur, for instance, control diseases of fruit trees, but they sometimes cause considerable injury to both the fruit and the leaves. Organic chemicals are giving as good control with less risk of plant injury. Their use has increased Anjou pear production 300,000 boxes annually. Efforts are now being made to find a fungicide that will protect wheat against the new race of stem rust that broke out last year.

A relatively new use for agricultural chemicals is as soil fumigants for controlling nematodes, insects, and other soil pests. The biggest problem is the high cost of application. Although the recent discovery of less expensive soil fumigants is encouraging, they are still too costly for field use, except for such high-value crops as tobacco, sugar beets, and vegetables. Even the cheaper ones cost $35.00–$40.00 per acre. A fumigant that can be applied for $20.00 an acre would probably be used extensively for cotton production in California. One that could be applied for $10.00 an acre would be economical over most of the cotton belt.

Chemicals for preserving crops and improving crop quality have received much scientific study during recent years. They are being used to protect fresh fruits and vegetables from disease damage during transit and storage, to prevent potatoes and onions from sprouting in storage, to hasten the ripening of several fruits, and to prevent preharvest drop of apples and pears. Experiments show that chemical apple-thinning gives a 15 per cent increase in yield for only a fraction of the cost of hand-thinning. Last year about 20,000 acres of apple orchards were thinned with dinitro sprays.

Science has barely scratched the surface in its exploration of chemicals as farming tools. In screening tests for plant growth-regulating activity, for example, the Department of Agriculture found more than a hundred new compounds sufficiently active to warrant further study. Thousands more are waiting to be tested, and even more are being compounded. Furthermore, research men are still finding new values in chemicals already in use.

R. M. SALTER

Bureau of Plant Industry, Soils, and Agricultural Engineering, ARA, USDA
Beltsville, Maryland

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What GENERAL ELECTRIC People Are Saying

A. J. NERAD

Research Laboratory

TASK OF APPLIANCES: Looking at the entire field of products which we call domestic appliances, it appears that they have undertaken and are doing a remarkable task. We are in a new kind of world in which domestic service has vanished with only a few remaining exceptions to prove this a rule. In the early history the purpose of the appliances was to improve the quality of domestic work and make toil somewhat less arduous. Now they have the added purpose of saving domestic labor to a high degree. It is amazing to consider how much has been accomplished in this direction.

The gradual injection of controls and integrators into the appliances has uniquely given them the equivalent of a thinking apparatus. By ordinary development processes, results have been achieved which appear as results of wizardry. The appliances not only think but act accordingly. Thus a dishwasher measures a given quantity of water and immediately at the right moment closes the valve. Clothes washers are in use which do a large number of complicated tasks in proper sequence. No human could follow as simply or quickly the electric blanket control in its compensation for changes in room temperature, for it would require adding or taking off blankets at a rate that is too trying and all too difficult to follow.

There are some unique advantages in this revolution in the home. You can't hire one-twentieth of a domestic servant, but you can obtain appliances one at a time. It is unthinkable to have domestic help 24 hours a day and seven days a week in these times, nor is it possible to suddenly obtain such help at any instant. Even in the good old days this could not be accomplished, but our present appliances are ready at any instant for use, and we need not have the slightest qualm at any time in their use. Some of them, like the oil and gas furnace controls, receive their instructions long ahead for long periods of time, and with less fault or omission than human beings they do the tasks once required by people in the house.

The appliances have taken upon themselves a very serious part in our life, indeed. It is thus easy to forecast that, in the light of future developments, theirs will be a firm place in the household. The appliances are not made yet which can take the place of a baby sitter, but some of them make the baby sitter's task less difficult and more pleasant. The future will also find that, to fill the lack of an appliance which will not only prepare the meal but plan it, is an engaging problem. It does not require too much dreaming to visualize a computer which turns out the most varied, healthiest, and most economic menu. Even without turning to the achievements of the future, it is easy to see why there has been such tremendous growth in the domestic appliance industry.

A.I.E.E. Conference
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General Engineering Laboratory

INSULATION: The history of electric power is a story of repeated demands for higher and higher blocks of power generation and transmission. Increasing power loads lead to increasing voltages of transmission for technical and economic reasons. Insulating air was soon replaced by silk or cotton wire coverings, sometimes coated or impregnated with varnish or waxes. Later, natural rubber jackets were applied.

Perhaps the first real contribution of chemistry to the science of electrical insulation was the application of vulcanized rubber as insulation for the conductor. But with continued demands for the transfer of larger and larger blocks of power, the inadequacy of available insulation soon became apparent.

To provide the engineer with means for adequately meeting the growing demands for electric power has been the opportunity for chemistry. It has met this opportunity and responsibility with a myriad of new products and processes and with the modification and improvement of older materials and processes.

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The Binocular Fusion of Yellow in Relation to Color Theories

Leo M. Hurvich and Dorothea Jameson

Color Control Division, Eastman Kodak Company, Rochester, New York

IN 1928 HECHT REPORTED A DEMONSTRATION OF THE BINOCULAR FUSION OF YELLOW from monocular red and green stimuli, and explicitly developed the implications of this fact for color theory (*1*). Hecht's demonstration has been widely reported and discussed and has frequently been cited as a crucial experiment with respect to the two major classes of color theory—namely, three-component and four-component theories (*2–9*).

If we take the Young-Helmholtz view as illustrative of a three-component theory, then we assume that

> there are three receptor systems in the retina . . . which may be designated as *B*, *G*, and *R* to indicate their essentially qualitative uniqueness in yielding, respectively, blue, green, and red sensations when brought into action by light. Each receptor system produces only the sensation unique for it, regardless of the part of the spectrum which sets in into action, and the sensations produced by various parts of the spectrum result from the combined action of these three systems in different degrees. Certain combinations produce specific effects. Thus the combined actions of the *G* and *R* systems result in the unique sensation of yellow, and the combined actions of *B*, *G*, and *R* result in the unique sensation of white (*10*).

On the other hand, in the Hering view, taken as representative of a four-component theory, two pairs of excitatory color processes are assumed to be located in the retina and the associated neural paths.[1] These four processes when brought into action by light yield paired yellow and blue sensations, and paired red and green sensations. Yellow, in this view, arises directly from the stimulation of the specific yellow process in the retinal-neural system (*11*). It is *not* the result of the combined action of two other processes, as in the three-component view.

Hecht's experiment was designed to evaluate these two sharply contrasting views of the receptor processes. Both the nature and logic of the experiment are best summarized in Hecht's own words:

> If a red light and green light fall on a given retinal area of one eye and a yellow sensation results, it is not possible to decide whether this is the result of a stimulation of two receptors or of one receptor. But if monochromatic red light falls on the retina of one eye, and monochromatic green light falls on the corresponding portion of the retina of the other eye, and the result is a yellow sensation, then only Young's idea is tenable, because there must be two receptors involved in making the yellow sensation from red and green (*1*).

As has been widely reported, Hecht's experimental results were positive. Viewing a white surface with a No. 29 Wratten filter (red) before one eye, and a No. 58 (green) before the other eye, the observer sees yellow.

Some investigators have been reluctant to accept this demonstration as decisive, and they have tended on the whole to dismiss the findings as an artifact of Hecht's experimental technique (*12, 13*). Much of the critical emphasis seems to have centered about Hecht's choice of red and green filters that had relatively wide and slightly overlapping spectral transmissions. More recently, however, Prentice (*14*) has been able to demonstrate that a binocular yellow can still be evoked using narrow band Farrand interference filters, which have no appreciable overlap in spectral transmissions. The result was obtained even for short exposure times and relatively low luminances. The phenomenon of binocular yellow is accordingly interpreted as a valid result and not simply as an artifact of a particular experimental technique.

We have no difficulty whatever in confirming these experimental results. Whether the two filters used for the monocular stimuli are relatively nonselective, such as those Hecht used, or highly selective,[2] such as those used by Prentice, the binocular fusion of yellow is the unmistakable result.

If the analysis is pursued no further, Hecht's formulation of the problem seems to have been given a direct and decisive answer. When monochromatic red light falls on the retina of one eye and monochromatic green light falls on the retina of the other eye, the result is a yellow sensation. Following directly from this positive experimental result, yellow must be a phenomenon that arises in the brain out of impulses coming from two kinds of fibers or processes in the retina, and no special substance or process would appear to be required in the retina for its reception. As a corollary conclusion, then, only Young's idea is tenable.

Upon closer scrutiny, however, the problem is considerably less simple and straightforward than it has appeared up to now. The logic underlying the crucial nature of this experiment is valid only on the assumption that a so-called monochromatic red stimulus evokes a red sensation and nothing but a red sensation, and that a so-called monochromatic green stimulus evokes a green sensation and nothing but a green sensation. Then, and only then, could the binocular yellow sensation that results from two such monocular stimuli be attributed without question to the central fusion of the two independent monocular processes. This is clear from Hecht's formulation of the Young-Helmholtz

[1] A third pair of processes mediates the black-white sensations.

[2] The interference filters were used with collimated light to assure maximal purity.

TABLE 1

SPECTRAL LOCI OF PURE HUES

	Blue locus (in mμ)	Green locus (in mμ)	Yellow locus (in mμ)
Hess (*15*, 21)*	475 – 477	497 – 500	577
Westphal (*16*, 202, 204)†	480.0 ± 1.7	507.9 ± 1.7	576.4 ± 1.7
Dreher (*17*, 48, 54)‡	477.4	509.4	575
Schubert (*18*, 88)§	465 ± 2.5	497 ± 2.0	573 ± 0.5
Purdy (*19*, 554)‖	476 ± 2.4	504 ± 3.0	576 ± 3.3
Kohlrausch and Van Meerendonk (*20*, 59)¶	478 ± 2.0	518 ± 3.7	574 ± 1.7
Dimmick and Hubbard (*21*, 252)**	475.1	515.5	582.5

* One observer. Partially dark-adapted neutral state.

† Averages for three observers (M, S, and B). These three observers alone observed at each of the three luminance levels used in the experiment. Bright-adapted state. Variability measure is the average M.V. for the three observers at all luminance levels.

‡ One observer. Bright-adapted state.

§ One observer (H). Partially dark-adapted neutral state. Variability measure is stated only as "variability."

‖ One observer. Values are averages for three luminance levels. State of adaptation not specified, probably partially dark-adapted. Variability measure is average deviation for all three luminances.

¶ Averages for three observers. Partially dark-adapted neutral state. Variability measure is specified only as "reproducibility."

** Averages for ten observers. Bright-adapted state. Values are means of regions delimiting pure hues. Mean variations available only for average limits of each region.

view quoted above. Unfortunately, however, even pure physical stimuli do not necessarily evoke pure hue sensations. The psychophysical relation between hue and wavelength is a complex one, and only a clear understanding of this relation can clarify the real meaning of the experimental results under discussion.

If we excite the retina by projecting upon it a physical spectrum that consists of a series of substantially homogeneous or pure wavelengths, under normal conditions the hues range from a slightly yellowish-red at one end of the spectrum, through reddish-yellow, yellow, yellow-green, green, blue-green, and blue, to reddish-blue at the other end. Such a division of the spectrum is not dictated by whimsical or semantic considerations. It is based on the precise experimental location of the psychologically unique or pure hues within the color spectrum. Pure red is absent from the spectrum, but the wavelengths that excite pure yellow, pure green, and pure blue are readily located. Locations of these pure or unique hues as determined experimentally by a number of investigators over a period of fifty years and for a variety of experimental conditions are shown in Table 1.

For any given observer the spectral extents corresponding to the pure blue, pure green, and pure yellow hues are extremely limited. For a neutral condition of adaptation[2] they are also independent of intensity. We have made determinations of these pure hues for two observers, at three luminance levels, 1.2, 12, and 120 mL, for a neutral condition of adaptation (10 minutes of preliminary dark-adaptation). The determinations were made with a Farrand monochromator for a narrow rectangular field, 1° 12′ in width and 32° in height, at the observer's eyes. A detailed description of this apparatus and of the experimental controls (i.e., viewing times, etc.) is contained in a report of related experiments (*22*). To determine the locus of a pure hue, the observer used a bracketing technique to adjust the wavelength to the pure hue transition point. For example, to locate a pure yellow, the wavelength is varied continuously between the limits where the hue becomes just noticeably reddish-yellow in one direction and just noticeably greenish-yellow in the other. A pure yellow point is selected between these two limits.

[2] The loci of the pure hues are very sensitive to changes in chromatic adaptation of the visual system (*11*).

Table 2 shows the wavelengths in millimicrons of the three pure hues for the two observers at the three luminance levels. Five measurements of each locus were obtained in a single experimental session, and five such experiments constitute a complete series. Each individual entry therefore is an average of 25 measurements, and the average result for all luminances (grand average) is based on 75 measurements for each observer. The average root-mean-square deviations (s) are less than 3 mμ in all cases. For a given observer, the pure point loci are independent of luminance, but, as the magnitude of the variability measures indicates, the differences in the wavelengths corresponding to the pure hues for the two observers are very real. In an experimental test neither observer will accept the settings of the other. These results are in good agreement with those reported by earlier investigators, and they confirm the narrow extents of the pure hues in the spectrum.

The average wavelengths of the pure hues for the two observers are shown graphically in Fig. 1. The locations of these hues are represented by the three vertical bars along the wavelength scale. All other

TABLE 2

SPECTRAL LOCI OF PURE HUES

Observer	Luminance (in mL)	Blue locus (in mμ)	s (in mμ)	Green locus (in mμ)	s (in mμ)	Yellow locus (in mμ)	s (in mμ)
DAJ	1.2	476.3	2.4	501.4	1.5	579.8	1.8
	12.0	476.1	1.6	495.3	1.9	578.7	1.3
	120.0	473.9	2.8	497.7	1.5	579.9	1.2
	Grand average	475.4		498.1		579.5	
LMH	1.2	469.5	2.0	489.4	1.7	589.3	2.9
	12.0	466.7	2.4	488.2	1.1	589.0	1.9
	120.0	467.9	2.6	491.7	2.1	588.3	2.1
	Grand average	468.0		489.4		588.9	

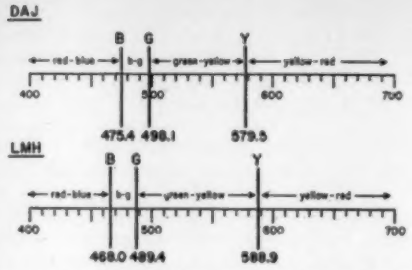

FIG. 1. Average locations of pure hues in the spectrum.

wavelengths in the spectrum elicit sensations that are mixed in hue. Starting from the short wavelength end, any homogeneous wavelength elicits a sensation that has both a red and blue hue component, with the blue becoming proportionately greater until the pure blue transition point is reached. Beyond the pure blue position any homogeneous wavelength elicits a sensation which has both a blue and green component, the green component becoming increasingly stronger until the pure green transition position is reached. Beyond the pure green any homogeneous wavelength elicits a sensation that has both a green and a yellow component, the yellow becoming increasingly more prominent until the pure yellow transition position is reached. Beyond this point all homogeneous wavelengths produce yellow-red sensations. In short, most physically pure spectral or so-called monochromatic stimuli evoke sensations that are mixed in hue.

It should be emphasized that this analysis is not contingent upon the specific hue names employed, nor is it conditioned by personal or cultural associations. The sensory discrimination of the unique or pure hues is made with relative ease and independently of any specific hue names used to characterize the perceptually discriminable differences in quality. The discrimination is ultimately dependent on the peculiar kind of discontinuity or change in *mode of variation* in hue which occurs at the transition points in question (*23*). These transition points might be referred to as points where a differential discontinuity occurs.

With this relation between homogeneous spectral stimuli and hue in mind, we may now return to the binocular mixture experiments which employ so-called red and green monocular stimuli. Fig. 2*a* shows the spectral transmission curves of Hecht's red and green Wratten filters, No. 29 on the right and No. 58 on the left. The vertical bars represent the locations of the pure hues for observer DAJ. It is clear from the positions of the maximal transmissions in relation to the pure point loci that the light transmitted by the "green" filter will evoke a predominantly yellow-green sensation in the one eye, and the light transmitted by the "red" filter a predominantly yellow-red sensation in the other eye. Quite apart from any fusion or cancellation of the monocular red and green hues, the hue component common to both monocular sensations is a yellow, and it would indeed be surprising if the binocular fusion product failed to exhibit a yellow hue.

The situation is not altered in any appreciable manner by using narrow band filters. Fig. 2*b* represents the spectral transmissions of the two Farrand interference filters used in the Prentice experiment. Considered in relation to the locations of the spectral stimuli which evoke pure hues, the light transmitted by these "red" and "green" filters similarly evokes predominantly yellow-red and yellow-green monocular sensations.

Furthermore, even with monochromatic homogeneous spectral stimuli selected from these same two spectral regions, the results are exactly the same. Trendelenburg (*24*) has reported binocular mixture results which include the wavelength pairs 671 mμ and 567 mμ, 617 mμ and 535 mμ, and 671 mμ and 535 mμ. In each instance the binocular mixture was equated to 589 mμ seen monocularly. The stimulus pair 671 mμ and 535 mμ (ordinarily used in the Rayleigh equation) is represented in Fig. 2*c*. Binocular yellow is reported in all instances. We have no difficulty in confirming these results in our laboratory.

The validity of the binocular fusion of yellow in

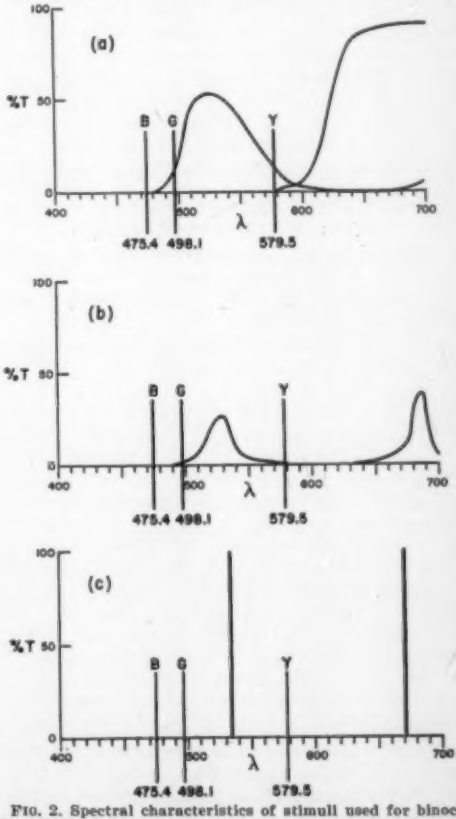

FIG. 2. Spectral characteristics of stimuli used for binocular yellow mixtures in relation to the loci of the pure hues in the spectrum.

experiments that employ stimuli each of which excites yellow monocularly, yellow-red in one eye and yellow-green in the other, is unquestioned. On the other hand, it is obvious that such experiments cannot be used to demonstrate that yellow arises in the brain as a fusion of two independent peripheral processes, a red process in one eye and a green process in the other. These results can be accounted for either in terms of a three-component theory with no independent peripheral yellow process, or in terms of a four-component theory which postulates such an independent peripheral process.

The next experimental step is an obvious one. What happens when we fuse a psychologically pure green presented to one eye with a psychologically pure red presented to the other eye? Pure red is, of course, extraspectral, but it can be obtained by mixing homogeneous stimuli from the long and short wavelength regions of the spectrum (*11, 23, 25–27*). A zero dispersion double monochromator, with a double slit and two variable neutral gelatin wedges in the vertical plane of the primary spectrum, was used to provide a monocular pure red stimulus. With the two slits fixed at the wavelengths 671 mμ and 440 mμ, each observer determined the intensity ratio of the two spectral components necessary to evoke a unique red sensation in the left eye—i.e., a sensation that is neither bluish-red nor yellowish-red. The average ($N = 25$) amounts of each component (in millilamberts) for each of two observers for a neutral state of adaptation (10-minute preliminary dark-adaptation) are:

DAJ: 12.8 (671 mμ) + 2.5 (440 mμ)
LMH: 12.8 (671 mμ) + 3.0 (440 mμ)

This unique red for the given observer was then presented to the left eye, and the spectral stimulus for pure green (provided by the Farrand monochromator) was presented to the right eye. The stimuli were viewed through two matched short-focus monocular telescopes, one in front of each eye. In order to facilitate binocular fusion, a 4.7° circular field was used. The ratio of the two monocular stimuli intensities was adjusted by means of a continuously variable neutral gelatin wedge in the optical path of the homogeneous green stimulus. As this ratio was varied, the binocular fusion product was predominantly reddish, predominantly greenish, or, at a critical mixture ratio, a neutral, hueless sensation. The binocular fusion of pure red and pure green is definitely not a yellow sensation. The average ($N = 5$) amounts (in millilamberts) for the critical mixture ratio for each of the two observers for a neutral condition of adaptation (10-minute preliminary dark-adaptation) are:

DAJ: 15.3 (671 mμ + 440 mμ) + 0.55 (498.1 mμ)
LMH: 15.8 (671 mμ + 440 mμ) + 0.36 (489.4 mμ)

Although this result is in direct conflict with the ordinary assumptions of a three-component theory, it is quite possible that further modifications in such a theory will enable it to account for the emergence of a white sensation from a mixture of pure red and pure green. This result is, of course, predicted by traditional four-component theories, where red and green are assumed to be opponent or complementary colors (*11*). Since any adequate color theory must, in the last analysis, integrate and account for a prodigious amount of experimental data, we should like to emphasize that it is not our intention to make a decisive evaluation of three- vs. four-component color theories on the basis of any single experiment. The fact that does clearly emerge from these results is that, unless there is a yellow sensation and corresponding to it some form of yellow excitatory process (whether a single or dual event) in each monocular system (and by that phrase we understand the combined receptor-neural processes), there is no mysterious, synthetic central emergence of the quality yellow.[4]

Finally, one experimental fact common to all these results should claim our attention. When yellow-red and yellow-green stimuli are mixed, the resulting sensation is a yellow. Neither the green nor the red aspect of either monocular stimulus appears in the final product. When pure red and pure green stimuli are mixed, the resulting sensation is a neutral at an appropriate mixture ratio. Here, too, neither green nor red appears in the final product. The nature of the mechanism whereby this central "cancellation" occurs constitutes a real problem.

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[4] Murray's original critique of Hecht's demonstration included the point that yellow was present in both monocular sensations (*12*). Although she recognized that this was true even for homogeneous physical stimuli, this aspect of her criticism seems to have received little attention.

Technical Papers

A Correlation of Severity of 2,4-D Injury with Stage of Ontogeny in Monocot Stems[1]

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Experiments with 2,4-D treatment of millet, *Setaria italica* (L.) Beauv., and green foxtail grass, *S. viridis* (L.) Beauv., show that the degree of injury to the stems is correlated with stage of maturity of the nodal parts. The modifications of the nodal parts form a series in degree of injury very much like that occurring in bean leaves after treatment with 2,4-D (*1*) and seen also in the leaves of many other plants, woody and herbaceous.

Seedlings of millet and foxtail grown in a greenhouse were treated 45 days after the seeds were planted by painting the upper surface of 2 leaves of each plant with a solution of 250 ppm of 2,4-D in water with 2% Tween. After a few days, swelling appeared in the bases of the internodes that were elongating at time of treatment. (The swellings involve the nodal level of the stem and are conveniently called nodal.) Since the effect of 2,4-D is upon immature tissues, it appears in monocot stems in these regions. The nodal swellings were larger in the millet than in the foxtail, which is much less sensitive to 2,4-D treatment.

As the swellings developed, a size series became evident. The most prominent enlargement was that at the second node (above the embryonic nodes), numbered 2 in Fig. 1. The swelling at the next older node, that below this, numbered 1, was much less prominent; No. 3 was the next most prominent, with Nos. 4 and 5 showing less and less evidence of injury. As the swellings increased in size, they became platelike expansions, most extensive on the side opposite the median point of leaf attachment (Fig. 1 *B*, node 3). (In the figure the inequality is partly concealed at some nodes because the widest part of the swelling lies behind the stem.) The zigzag form that develops in the stem at this time is apparently due to the one-sided swelling in the nodal regions.

When the platelike stage is well established, adventitious root tips appear in large numbers over the distal part of the swellings, and roots develop rapidly. The time of appearance of these roots, and the extent of their development at any one time, are parallel to the size of the swellings and supply additional evidence of the series in the effect of the treatment. Root length may not always fit into the series because the roots close to and at the ground level may become established in the soil and continue to grow, whereas those higher on the stem die and begin to rot away as the plant becomes moribund.

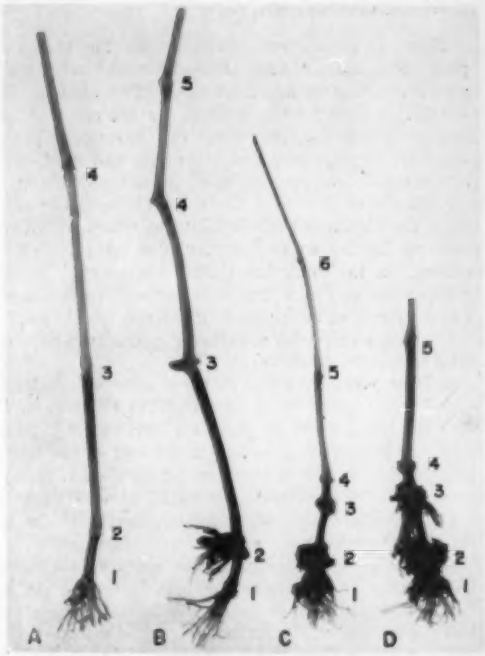

FIG. 1. Seedlings of millet with leaves removed. *A*, normal; *B–D*, treated, *B* and *C* 21 days, *D* 35 days, after treatment. *B–D* show platelike swellings of nodal regions forming a series in size related to stage of internodal development at treatment. Greatest enlargement at node 2, with decrease upward and downward. Adventitious roots (just appearing at node 3 in *B*, *C*) at greatest length at node 2 (in *C* and *D* dead and decaying). (Length of internodes varies greatly with individual plants and is not significant.) × 75.

Fig. 1 shows the stems of normal and treated millet seedlings with leaves removed. The swellings of the lower nodes are concealed by the roots, but the approximate development can be judged. The lowest node (above the nodes of the embryo), No. 1, shows rather slight enlargement; the next node above (2) shows the greatest enlargement; those above show progressively less and less swelling toward the apex. The series is thus similar to that seen in dicot leaves. Stems therefore demonstrate, as do leaves, that the effect of 2,4-D is upon the maturing tissues—the injury becoming evident as the tissues continue development; that the extent of injury is dependent upon stage of development when treated; and that the effect is brief. If the effect were not brief, but continuing, the modifications would be the same in successive internodes.

[1] This paper is based upon work done for the Biological Department, Chemical Corps, Camp Detrick, Frederick, Md., under Contract No. W-18-035-CM-237.

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Piedmont Plains of India and Pakistan

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There is hardly any literature on the piedmont plains of India, although their origin and other characteristic features are interesting. The base of the Himalayas is generally fringed by alluvial fans so closely spaced that they form one continuous plain. They are largely composed of gravels and sand, with interspersed boulders brought down by floods produced by torrential rains. The composition of the soils, their porosity, and their inability to retain water are some of the factors that render them unfit for cultivation. On the other hand, they are covered locally with forests or dense jungle. In India there are excellent examples of such plains, which are called *bhabar*. These fans merge with the alluvial plains composed of finer materials, called *tarai*.

Bhabar plains. *Bhabar* forms a narrow belt lying immediately below the foothills of the Himalayas. It is a sloping deposit of gravels with occasional sand and clay beds. It is especially developed in the Naini Tal district, is generally covered with forest, and is remarkable for a complete absence of water. On reaching this *bhabar* zone most streams disappear. Large streams preserve their courses with marked diminution in volume, and their breadth increases abruptly, but the smaller watercourses, which have their origin in the lower hills, lose themselves in the shingle deposit. The slope of the surface is generally toward the south, and the breadth of the zone varies from 5 to 15 miles. The forest vegetation derives its nourishment from a thin covering of alluvial soil that overlies the coarse alluvium. Instead of tall grasses, large trees of haldu (*Adina cordifolia*) and *Acacia catechu* are to be observed. The cultivation depends upon canal irrigation, which is provided from the streams of lower hills. The slope of the ground between the foothills and the *tarai* is appreciable, though not easily observed. The population is largely migratory and moves to the hills in summer and returns in November.

Tarai plains. Below the *bhabar* occur the *tarai* plains, which form a belt about 11 miles wide from north to south in Nepal, Bihar, in the districts of Naini Tal, etc. The plain slopes gently toward the southeast and is covered with forests and swamps, broken by scattered patches of cultivation. The northern half consists either of jungle or savanna, where the country is suited only for grazing.

At the southern edge of the *bhabar*, springs appear in a series of morasses, their number and size depending upon the breadth of the *bhabar*. Where the *bhabar* is narrow, the springs are feeble. From them rise sluggish streams with poorly defined channels.

The moist plains of *tarai* pass gradually into the plains of the Ganges at lower elevations. The change is transitional, as the soil loses its marshy nature, different vegetation appears, and the climate becomes more healthful. Rice is the main crop of this region. The partition of the country and the refugee problem have thrown extra pressure on the land, and the *tarai* lands, especially in the Naini Tal region, are being reclaimed for the rehabilitation of some refugee families.

Piedmont plain of Baluchistan. Baluchistan provides an interesting example of the piedmont plains in an arid climate. Here the mountains are fringed by alluvial fans and talus of Pleistocene age. The slope of these coalescing fans, locally called *daman*, is so gentle that it looks like a very gently inclined plain. These compound fans have a variable composition, consisting of alternating coarse conglomerates and finer deposits. The scanty rainfall is absorbed and stored in the permeable conglomerates, which perform an important role in the economic geography of the region. Horizontal tunnels, called *karez*, which may be several miles in length, are bored into the sloping deposits until they reach the water table. The water is held under hydrostatic pressure, which makes it flow at the mouth of the tunnel. Recently artesian wells have been sunk in these deposits, creating oases in an otherwise barren desert.

Free Amino Acids in Potato Tubers Altered by 2,4-D Treatment of Plants

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A number of workers have studied the effects of natural and synthetic plant hormones on nitrogen metabolism (*1–13*). A survey of the literature has failed to show a critical study of the free amino acids in plants treated with natural or synthetic plant hormones. The free amino acids, especially glutamic acid, have been shown to occupy a key position in the interpretations of the mechanisms of respiration and protein synthesis. Investigations of the free amino acids in hormone-treated potatoes were begun at this station in the summer of 1950.

The Red McClure potatoes used were selected from the "field test samples" described by Payne *et al.* (*14*). Treated and untreated tubers were frozen and then allowed to thaw. The free soluble amino acids were extracted according to Morrow and Sandstrom (*15*). The filtrates were concentrated to one fifth their original volume. The technique of paper partition chromatography, devised originally by Consden, Gordon, and Martin (*16*), and later used on potato extracts by Dent, Stepka, and Steward (*17*), was employed. For the one-dimensional chromatograms 1 µl of the concentrated filtrate was used on Whatman No. 1 filter paper in a phenol-H_2O system.

Relative densities of the amino acid spots were

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determined by use of a Welch densichron No. 2150 with a green N filter.

The data are shown in Table 1. Each value is the mean of 14 determinations except in the case of serine, where only 10 determinations were used. Only 12 of the possible 18 amino acids identified in the concentrated filtrate were critically measured. The data show that all the free amino acids measured were significantly decreased in the treated samples, with the exception of glutamic acid. Glutamic acid in the treated samples showed a significant increase over the controls.

TABLE 1

EFFECT OF 2,4-D TREATMENT ON FREE AMINO ACIDS IN TUBERS OF RED MCCLURE POTATOES*†

Spot No.	Amino acids	Mean densichron units: Treated	Mean densichron units: Control	Diff	Standard deviation	Standard error	Min diff req for significance: .05	Min diff req for significance: .01
1	Isoleucine phenylalanine	1.63	1.95	0.32	0.13	0.04	0.03	0.04
2	Valine, γ amino butyric acid	2.06	2.35	.29	.18	.05	.14	.19
3	Lysine	1.46	1.58	.12	.14	.04	.11	.15
4	Glutamine, alanine	2.47	2.82	.35	.14	.04	.11	.15
5	Threonine	1.40	1.58	.18	.10	.03	.08	.11
6	Asparagine	1.78	1.93	.15	.10	.03	.08	.11
7	Serine	1.46	1.56	.10	.03	.03	.08	.11
8	Glutamic acid	2.68	2.47	.21	.15	.04	.12	.16
9	Aspartic acid	2.07	2.17	0.10	0.12	0.03	0.09	0.12

* Arginine, proline, histidine, tyrosine, methionine sulfoxide, and cysteic acid, although identified by two-dimensional chromatograms, appeared in concentrations too small to measure.
† Concentrated filtrates were used on one-dimensional chromatograms for this table.

The complete details of this work and its significance in the interpretation of the mechanism of 2,4-D action are being published elsewhere.

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The Growth of Peanut Plants at Various Diurnal and Nocturnal Temperatures

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While doing research on other problems of peanut development at the California Institute of Technology, the opportunity was taken of studying the effects of controlled temperatures on the growth of the improved Valencia variety of *Arachis hypogaea* L. Although large-scale experiments were not carried out under the two colder night temperatures, the observed differences were so marked and clear-cut that it seems worth while to report them.

The air-conditioned greenhouses at the California Institute of Technology have been described by Went (*1*). Peanut seeds were germinated outdoors in early September, and 16 plants were moved into the greenhouse on October 2, 1945, when the mean height of each replicate was 1.4 in. measured from the cotyledonary node to the distal attached edge of the stipules on the topmost extended leaf. Groups of four plants were placed under each of the temperature combinations indicated in the first column of Table 1. All plants had 8 hr of daylight and were grown in coarse sand watered twice daily with Hoagland's nutrient solution. The growth after 2 weeks is shown in Table 1. At this time all leaves of 26°-day plants were a healthy dark-green and were about 2 in. long. The younger leaves of the 18°-day plants were all yellow, none exceeding 1.3 in. in length.

Although the first flower appeared by October 17 on a 26°-day: 30°-night plant, by November 7 the 26°-day: 27°-night plants had an average of 4 gynophores/plant contrasted to only 1 gynophore/plant for the 26°-day: 30°-night plants. The latter showed markedly greater vegetative growth, however. No flowers appeared on the 18°-day: 16°-night plants during the 4 months of the experiment. Although a few flowers with unelongated calyx tubes appeared on the 18°-day: 22°-night plants after November 16, no gynophores developed from the 18°-day plants during the ensuing 4 months. (The developmental anatomy and physiology of the gynophore are described by Jacobs [*2, 3*].)

The results with peanut plants agree with those of

TABLE 1

VEGETATIVE GROWTH OF PEANUT PLANTS UNDER VARIOUS TEMPERATURE COMBINATIONS

Temperature: Day	Temperature: Night	Mean height (inches)	Mean number of branches
26°	30°	2.8	9.3
26	27	2.6	8.0
18	22	1.7	5.5
18°	16°	1.7	5.0

Went on tomatoes (*4*) and those of Dorland and Went on chili peppers (*5*) as far as vegetative growth is concerned. Thus, the peppers showed greatest vegetative growth, while still small, at 27°-day: 30°-night. Young tomato plants also showed maximum stem elongation at the highest pair of temperatures tested (27°-day: 27°-night).

The gynophore of the peanut has no close parallel in tomatoes or peppers, being most conveniently considered a stage intercalated between flower development and fruit development. Correspondingly, the evidence concerning a temperature optimum for growth of the gynophore finds no parallel in published results on flower or fruit development in tomatoes and pepper.

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The Antimicrobial Principle of *Clematis Dioscoreifolia*

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In the course of a survey designed to test green plants of this region for antimicrobial activity, it was noted that freshly prepared aqueous extracts of *Clematis dioscoreifolia* showed unusually strong activity against gram-positive and gram-negative bacteria and thus resembled a number of other species of Ranunculaceae tested previously (*1*). The activity was maintained for more than two months of storage in a refrigerator but diminished quickly at room temperature. Extracts of plant material from dried leaves were inactive.

Extraction of the aqueous solution with a variety of organic solvents, of which ethyl acetate appeared to be the best, caused the activity to move into the organic layer. In an attempt to isolate the active principle, the aqueous solution resulting from the extraction of approximately 1 kg of freshly picked plant was extracted with ethyl acetate. Removal of the organic solvent at reduced pressure, followed by several recrystallizations of the residual gum from a mixture of ethyl acetate and ligroin, yielded 204 mg of shiny white plates (mp, 151° C), which were shown to be identical with anemonin (*2, 3*) by analysis, color reactions, and mixed melting point.[1]

The distribution of anemonin in a number of Ranunculaceae has been discussed recently (*4*). Since the solutions used in our work possessed the extremely irritating properties of protoanemonin commented upon by other workers (*2, 3*), there can be little doubt that protoanemonin is responsible for the antimicrobial activity of *Clematis dioscoreifolia*, but dimerized to the inactive anemonin under the conditions employed for its isolation.

[1] We wish to thank Beatrice C. Seegal and S. Raymond for an authentic sample of anemonin.

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The Chemical Kinetics of Procaine and Chloroprocaine Hydrolysis

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Kisch (*1*) in 1943 reported his studies on procaine esterase. Since that time a number of microanalytical methods have been recommended for the determination of procaine and *p*-aminobenzoic acid in biological fluids. A reliable and simple method was described by Ting *et al.* (*2*). The authors of this paper have shown that Ting's method is also applicable to 2-chloroprocaine[1] and 2-chloro-4-aminobenzoic acid (*3*). Ting's method was utilized in the study of the chemical kinetics of the alkaline and enzymatic hydrolysis of procaine and chloroprocaine reported in this paper.

Bullock (*4*) demonstrated the instability of alkaline-buffered procaine solutions and measured the rate of decomposition of procaine at various pH's and temperatures. Although no actual mention is made in his paper of the kinetics of the reaction, the data presented seem to indicate that the alkaline hydrolysis of procaine is a first or second order reaction.

To study the alkaline hydrolysis, solutions containing around 4×10^{-4} moles/l of procaine or chloroprocaine and 7×10^{-4} moles/l NaOH were incubated at

TABLE 1

The Relationship between Time and the Quantity of Procaine and Chloroprocaine Hydrolyzed in Alkaline Media

Time (min)	Quantity procaine hydrolyzed (moles/l × 10^5)			Quantity chloroprocaine hydrolyzed (moles/l × 10^5)		
	Exp 1	Exp 2	Exp 3	Exp 1	Exp 2	Exp 3
30	5.2	8.0	7.9	12.0	13.2	9.4
60	10.3	12.8	13.1	21.2	21.8	16.4
90	16.4	17.4	17.5	27.2	27.5	22.0
120	20.1	21.8	21.8	30.6	30.3	25.2
150	24.1	25.3	24.6	32.1	32.2	27.8
180	27.2	28.5	27.2	33.5	33.7	29.7
210	—	31.0	29.5	—	34.3	30.7
240	—	32.8	32.8	—	34.6	32.0

[1] The chloroprocaine and the 2-chloro-4-aminobenzoic acid were supplied through the courtesy of L. Reiner, of Wallace and Tiernan Products, Belleville, N. J.

37° C. Samples were withdrawn at known time intervals into excess acid, thus stopping the hydrolysis. The procaine and *p*-aminobenzoic acid or chloroprocaine and chloro-aminobenzoic acid content of the samples was determined. Table 1 shows the results of three experiments.

The data of Table 1 indicate that the amount of procaine and chloroprocaine hydrolyzed increased logarithmically. Furthermore, since the initial ester and hydroxide concentrations were of the same order of magnitude, the reaction should be of the second order, expressed by the differential equation

$$\frac{dx}{dt} = K(a-x)(b-x),$$

where dx is the amount of ester or hydroxide reacted during the time dt, a is the initial amount of the ester, b the initial amount of the hydroxide, and K the reaction rate constant. The integration and rearrangement of the above equation leads to

$$t = \left[\frac{2.303}{K(a-b)} \log \frac{b}{a}\right] + \frac{2.303}{K(a-b)} \log \frac{a-x}{b-x}.$$

Since a and b are constants, t plotted against log $[(a-x)/(b-x)]$ should give a straight line the slope of which is equal to $2.303/K(a-b)$. The curves obtained in one of the procaine and one of the chloroprocaine hydrolysis experiments are shown in Fig. 1. It can be seen that the points fall close to a straight line, indicating that the reaction is of second order.

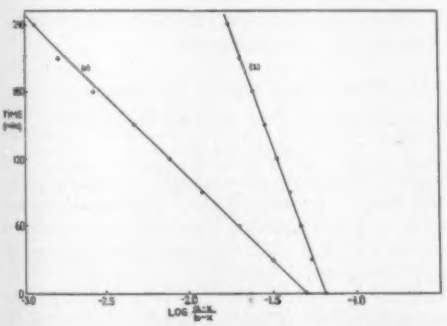


FIG. 1. Reaction rate curves of the alkaline hydrolysis of procaine (2) and chloroprocaine (1).

The average reaction rate constant of procaine was found to be 0.784 l/min × mole, that of chloroprocaine 2.29 l/min × mole, which means that chloroprocaine in alkaline media is hydrolyzed about three times faster than procaine.

The enzymatic hydrolysis of procaine and chloroprocaine was studied by incubating human plasma samples containing 3.7×10^{-4} moles/l of procaine or 3.3×10^{-4} moles/l of chloroprocaine at 37° C. At various time intervals samples were withdrawn into 3.75% trichloracetic acid, the hydrolysis stopped, and the procaine and *p*-aminobenzoic acid, or chloroprocaine and chloro-aminobenzoic acid, content determined. The results expressed as the quantity of procaine hydrolyzed in a given time interval are given in Table 2; similar data for chloroprocaine are presented in Table 3.

TABLE 2

RELATIONSHIP BETWEEN TIME AND THE QUANTITY OF PROCAINE HYDROLYZED IN PLASMA

Time (min)	Quantity procaine hydrolyzed (moles/l × 10^5)	
	Plasma 1	Plasma 2
2	3.5	—
3	5.7	3.9
5	9.9	10.7
8	16.3	16.8
10	19.3	25.2
12	25.7	—
13	—	31.2
14	28.2	—
15	32.6	36.6

TABLE 3

RELATIONSHIP BETWEEN TIME AND THE QUANTITY OF CHLOROPROCAINE HYDROLYZED IN PLASMA

Time (min)	Quantity chloroprocaine hydrolyzed (moles/l × 10^5)	
	Plasma 1	Plasma 2
1	8.5	10.4
2	18.3	20.7
3	28.5	31.0

The relationship between time and the quantity of procaine or chloroprocaine hydrolyzed (Fig. 2) indicates that there is a linear relationship between time and the quantities hydrolyzed. The independence of the reaction rate from the initial concentration is also evident from Fig. 3. The points on this graph were obtained by hydrolyzing 3 plasma samples containing 73.2, 36.6 and 18.3×10^{-5} moles/l of procaine, respectively, at 37° C, and withdrawing samples at the indicated time intervals. The amount of nonhydrolyzed procaine was plotted against time. The 3 lines drawn through the obtained points are parallel, indicating

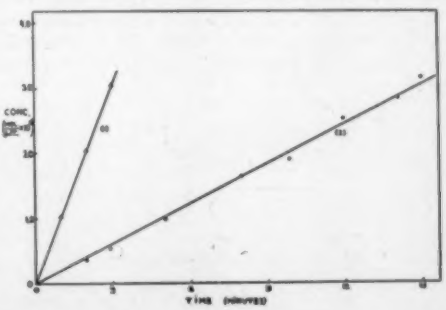


FIG. 2. Reaction rate curves of the enzymatic hydrolysis of procaine (2) and chloroprocaine (1).

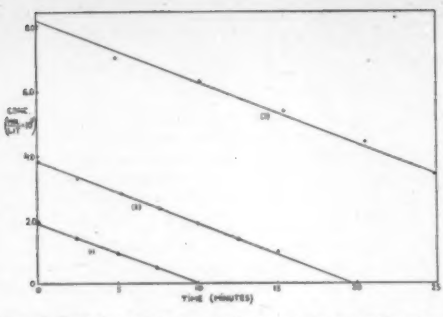


FIG. 3. Relationship between time and the quantity of non-hydrolyzed procaine in samples of various concentrations.

that the reaction rates were equal in all samples.

This means that the enzymatic hydrolysis of procaine and chloroprocaine is a zeroth order reaction. The reaction rate constants obtained for three different plasma samples are given in Table 4. As can be seen from this table, chloroprocaine is hydrolyzed about four times faster than procaine.

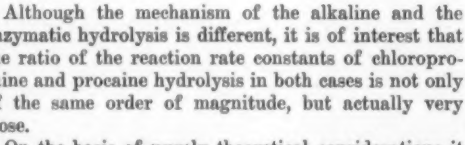
TABLE 4

THE REACTION RATE CONSTANTS (K) OF THE ENZYMATIC HYDROLYSIS OF PROCAINE AND CHLOROPROCAINE AT 37° C

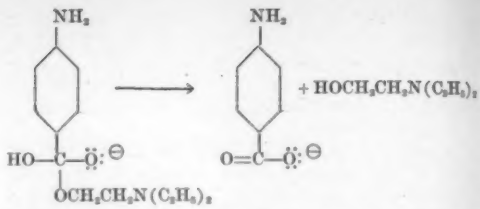
	K in moles/l × min		
	Exp 1	Exp 2	Exp 3
Procaine	2.58×10^{-4}	2.41×10^{-4}	2.45×10^{-4}
Chloroprocaine	1.03×10^{-3}	0.92×10^{-3}	1.04×10^{-3}
$\frac{K_{\text{chloroprocaine}}}{K_{\text{procaine}}}$	3.99	3.83	4.24

Although the mechanism of the alkaline and the enzymatic hydrolysis is different, it is of interest that the ratio of the reaction rate constants of chloroprocaine and procaine hydrolysis in both cases is not only of the same order of magnitude, but actually very close.

On the basis of purely theoretical considerations it was not definitely predictable what effect the substitution of a chlorine atom in the benzene ring would have on the speed of hydrolysis of the procaine molecule. The positive center at which the hydroxyl ion attack should be expected is the carbonyl carbon atom:



The decomposition of this complex will then proceed as follows:



Since the rate-determining step in the above reaction chain is the attachment of the hydroxyl ion to the carbonyl carbon atom, any electrophilic substituents in the benzene ring, which withdraw electrons from the carbonyl carbon atom, will facilitate this reaction and speed up the hydrolysis. The substitution of chlorine conceivably can have one of two effects: It can either exert its electron-attracting permanent polarization effect, or its electron-releasing resonance effect can be predominant. Our experimental findings indicate that when chlorine is substituted in the procaine molecule, the first of these two possibilities is prevalent.

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The Oncological Aspect of the "Immunity" of *Colchicum* to Colchicine

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In the course of his early colchicine work, the senior author came to the conclusion (*1*), as other workers had (*2, 3*), that *Colchicum autumnale* was totally resistant to the toxic, stathmokinetic, and oncogenic actions of colchicine.

Since then, this immunity has been seriously questioned by Cornman (*4*), who elicited typical colchicine mitoses in the roots of *Colchicum* by using higher concentrations of the drug than previous investigators. Levan and Steinegger (*5*) have, however, argued that the striking results obtained by the American author were not due to the alkaloid, but to the chloroform of crystallization in the drug.

These findings have revived old problems and have raised new ones that seem worth investigating—this so much the more so as in the references at our disposal we have found information only on the responses of the roots, whereas previous experiments of Havas[2] have furnished ample indications of the divergent oncogenic and growth effects of extracts of the various organs of *Colchicum*. If different organs of

[1] CNRS and IUBS—Unesco fellow for 1950–51. (Died June 9, 1951.)

[2] Observations and photographic records in press.

the plant yield extracts of different chemistry, it seems logical to expect differences in responses of those organs. On account of their sensitivity the pollen tubes appeared to be the most conveniently adapted to the present preliminary test.

About 4,500 pollen grains of *Colchicum autumnale* L. were germinated under sterile conditions in watch glasses, placed in Petri dishes, and kept at room temperature. The culture solution was composed of 1 g gelatin and 5 g sucrose dissolved in 100 ml tap water. To this, with the exception of the controls, either Merck's crystalline colchicine, containing 12.5% chloroform (hereinafter called colchicine *b*), or pure chloroform (Fr. Ph.) was added in the concentrations shown in Table 1. The culture media were heat-sterilized (according to Tyndall's method) *before* adding the above substances, with the exception of a supplementary colchicine series in three concentrations, in which the order of the process was reversed. As a consequence of this treatment practically all the chloroform content of such solutions (hereinafter called colchicine *a*) was evaporated. The respective concentrations of pure chloroform were calculated to correspond to the full chloroform content (12.5%) of the respective solutions of colchicine *b*. The rate of germination was recorded, and the pollen tubes were measured and drawn to scale 6 times in the course of each of the experiments. Table 1 shows three of these readings.

The typical effect of colchicine on any germinating pollen grain includes a decreased longitudinal growth of the tube, twisting of the tube, and swelling at the tip. This swelling is apparently identical with the swelling of cells that form tumors in colchicine-treated roots, and is therefore considered an oncogenic effect. The quantitative gradations of effect are recorded in Table 1. The last two columns reveal the significant fact that, although 1% colchicine (both *a* and *b*) induced in the pollen tubes very marked oncogenic effects both from a quantitative and a qualitative point of view, the same concentration of pure chloroform (0.125%) as that contained in the 1% solution of colchicine *b* displayed absolutely none. Paradoxically enough, a lower concentration (0.05%) of pure chloroform, corresponding to the chloroform of crystallization in 0.4% colchicine *b*, produced typical colchicine tumors. These, although significantly less numerous than those induced by 0.4% colchicine *a* or *b*, equaled them in size. As Table 1 shows, none of the other concentrations of pure chloroform had oncogenic effects. In colchicine *a* and *b* the threshold of this activity was 0.1%. Although very few typical club-shaped tumefactions were noticed in this concentration, the pollen tubes were distinctly thicker than those of the controls, and many of them twisted into concentric convolutions. Chloroform at 0.0125%, corresponding to the concentration in 0.1% colchicine *b*, did not show even these anomalies.

As regards the elongation of the pollen tubes, Table 1 shows that 1% and 0.4% colchicine (*a* and *b*) had very marked inhibitory effects, and that even 0.1% depressed it quite considerably as compared with the controls. The nononcogenic concentrations of the drug had no such influence. It is interesting to note that, whereas 1% colchicine *b* reduced the average length of the pollen tubes by about 89%, pure chloroform in the same concentration (0.125%) as the chloroform of crystallization present in 1% colchicine *b* reduced it only to the extent of about 14%. So far, these observations are in keeping with the general rule that elongation antagonizes the formation of colchicine tumors (*6*). On the other hand, in the 0.05% solution of pure chloroform (equal to the chloroform content of 0.4% colchicine *b*), the largest tumor (diam, 60 μ) was precisely produced on one of the longest (1,128 μ) pollen tubes, whereas in colchicine *b*, the largest

TABLE 1*

	No. pollen grains	2 hr			14 hr			27 hr				
		G	*L*	*M*	*G*	*L*	*M*	*G*	*L*	*M*	*T*	*S*
Control	600	10	22	32	75	504	1,110	90	945	1,480	0	—
Colchicine *b* 2%	300	0	—	—	0	—	—	0	—	—	—	—
" *a* 1%	210	5	11	14	6	48	200	9	110	270	72	+++++
" *b* 1%	300	3	9	11	5	42	175	7	95	310	80	+++++
Chloroform 0.125%	300	3	18	50	85	435	1,250	87	820	2,025	0	—
Colchicine *a* 0.4%	210	24	12	17	36	69	221	72	108	695	38	++
" *b* 0.4%	300	29	9	13	40	56	150	76	115	759	42	++
Chloroform 0.05%	300	5	14	55	12	105	680	15	616	1,274	25	++
Colchicine *a* 0.1%	210	25	9	15	60	106	255	80	645	1,200	12	+
" *b* 0.1%	300	35	8	12	55	95	280	74	680	1,156	10	+
Chloroform 0.0125%	300	13	20	35	80	480	872	93	880	1,436	0	—
Colchicine *b* 0.025%	300	45	12	15	63	560	865	88	1,002	1,298	0	—
Chloroform 0.0031%	300	15	25	39	81	578	1,220	88	840	1,660	0	—
Colchicine *b* 0.0066%	300	12	20	55	70	680	1,340	85	1,170	1,515	0	—
Chloroform 0.00093%	300	11	19	34	74	600	1,040	93	795	1,500	0	—

* Averages of two experiments, one of which is in duplicate. *G*, germination %; *L*, average length of pollen tubes (μ); *M*, maximum length attained by the longest of the pollen tubes; *T*, number tumors/100 pollen tubes; *S*, relative size of tumors.

intumescence (39 μ) was exhibited on a tube not exceeding 144 μ. Although not as extreme, similar observations were by no means exceptional. It may further be mentioned that, although not oncogenic, the weaker concentrations of chloroform had a tendency to depress the average length of the pollen tubes. As opposed to the effects of colchicine *a* and *b* on tumor growth vs. elongation, those of chloroform were in consequence far from being consistent.

As can be seen, 2% colchicine *b* prevented germination altogether. In the other concentrations the percentage of germination of the pollen grains was in fair agreement with the length attained by the pollen tubes and in inverse relation to the oncogenic potency and the toxicity of the various concentrations of the drugs. Chloroform at 0.125% was once more an exception to this rule. Some of the very considerable divergency in the rate of germination at the very beginning of the experiment may be ascribed to the chance distribution of the large (46 μ–54 μ) and small (30 μ–35 μ) pollen grains, for, as was empirically demonstrated, the former germinated much earlier than the latter. However, such sources of error were, as can be seen, automatically eliminated by the end of each experiment when maximum growth was attained.

Although in most plants the threshold of the oncogenic influence of colchicine upon roots is higher than the threshold value of its stathmokinetic action, the pollen tubes of *Colchicum* were found to be 10–25 times more sensitive to the oncogenic effects of the drug than were the roots to its stathmokinetic activity, according to the findings of Cornman. Yet, when compared with the reactivity of other plants—e.g., wheat, in which germination and growth are completely stopped at 0.4% and tumors are found at 0.0075%—even the pollen tubes of *Colchicum* were found to display a marked resistance to the alkaloid.

In view of the practically identical oncogenic action of colchicine plus chloroform of crystallization and colchicine from which the chloroform was removed, previous axiomatic assertions (*2, 3*), including that of the senior author (*1*), regarding the total immunity of the plant to the alkaloid can hardly be maintained. The findings of Cornman are thus complemented and implicitly confirmed.

Production of pollen tube tumors in *Colchicum* confirms the oncogenic action of chloroform reported by Steinegger and Levan (*7*) for *Allium*. Our experiments do not, however, substantiate a generalization of the thesis of Levan and Steinegger, according to which the action of the alkaloid in *Colchicum* is to be ascribed to the chloroform of crystallization in the drug. In fact, the above-mentioned inversion of the logically inferable respective growth effects and oncogenic potency of 0.05% vs. 0.1% chloroform, as well as the remarkable difference in the length of tubes with colchicine- vs. chloroform-induced swellings, seem to justify the hypothesis, suggested by Cornman, that different mechanisms are operating.

It is readily admitted that, as they now stand, our investigations emphasize rather than resolve the enigmas associated with the complex problem of immunity. Nevertheless, it is hoped that by confirming, in refractory material such as *Colchicum*, the existence of different oncogenic sensitivities and reactivities in different organs of the same organism, search for their active principle will be encouraged. Given the chemotherapeutic implications of the oncogenic (*1, 8, 9*) and oncolytic (*10, 11*) actions of colchicine in both plants *and* animals, it may not be too far-fetched to recall that also among the animals many were thought resistant to various carcinogens, including colchicine, until the appropriate site of administration had been discovered.

Addendum: According to a personal communication from Dr. Cornman, received when this article was ready for press, the colchicine used by him contained no chloroform. The susceptibility of *Colchicum* to colchicine is thus mutually confirmed.

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Changes in Biliary Cholesterol in Abnormal Thyroid States[1, 2]

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It has long been realized that an inverse relationship exists between plasma cholesterol concentration and the level of thyroid activity (*1*). In general, hyperthyroidism is associated with a decreased plasma cholesterol level and hypothyroidism with an elevated concentration, although these changes are not always striking (*2*). The mechanism underlying this relationship remains unexplained. Recent studies from this laboratory (*3–5*) suggested to us the possibility that knowledge of the bile cholesterol content in abnormal thyroid states might help to clarify this important problem.

Two separate series of male Long-Evans rats, aged 8 and 13 weeks, respectively, were studied. Each series consisted of three groups. One group (control) of the first series was fed a stock diet for 28 days; the sec-

[1] Preliminary report.

[2] Aided by a grant from the U. S. Public Health Service and the American Heart Association.

[3] Fellow of the American Heart Association.

[4] The authors are grateful to Parke, Davis & Co. for thyroid substance and to Winthrop-Stearns, Inc., and Parke, Davis & Co. for the thiouracil used in these studies.

TABLE 1

Type of rat	No. of rats	Average wt		Daily vol of bile (ml)	Bile cholesterol	
		Initial (g)	Final (g)		Concentration (mg/100 ml)	Daily output (mg)
Series 1						
Control	6	—	181	11.1	27 (22–36)*	2.9 (1.9 – 3.8)
Hypothyroid	6	174	190	9.8	13 (12–14)	1.2 (1.1 – 1.3)
Hyperthyroid	10	150	158	10.0	45 (27–62)	4.4 (2.7 – 6.2)
Series 2						
Control	10	249	310	14.5	17 (13–20)	2.4 (1.7 – 3.4)
Hypothyroid	11	232	266	13.2	8 (4–13)	1.1 (0.35– 2.0)
Hyperthyroid	7	252	308	19.4	38 (21–61)	7.4 (3.9 –11.5)

* Figures in parentheses represent range.

ond group of the same series was given stock diet plus powdered thiouracil (constituting 0.25% of the diet) for 33 days, and the third group received stock diet plus powdered thyroid substance (constituting 0.12% of the diet) for 18 days. The second series was maintained for 42 days, controls receiving stock diet, the second group receiving thiouracil in addition as 0.3% of the diet, and those given thyroid substance receiving this material as 0.3% of the diet. Dietary supplements administered as above have been shown (*6*) to induce hypothyroidism and hyperthyroidism, respectively, in rats. The general condition, weight changes, and behavior of our groups of rats confirmed this observation.

At the termination of the feeding periods, the bile duct of each rat was catheterized (*3*), and bile was collected for 24 hr. Bile cholesterol was extracted from each individual 24-hr sample according to the method of Foldes (*7*) and analyzed according to an adaptation of the method of Saifer and Kammerer (*8*), as described previously (*3–5*).

As Table 1 demonstrates, the hyperthyroid rat in both series was found to excrete far more cholesterol in his bile than the normal animal. Thus, in the first series, both the concentration of cholesterol in the bile and the daily biliary excretion of cholesterol were almost twice that found in the control rat. In the second series, more than twice the control amount of biliary cholesterol was excreted by the hyperthyroid rat. Conversely, the biliary concentration and daily output of cholesterol in the hypothyroid rat was about half that found in the normal control rat. It should be mentioned that the variations observed between the first and second series were quantitative, not qualitative, and very possibly were attributable to differences in age and weight of the animals in the two series (*9*).

This disturbance in biliary concentration and output of cholesterol in thyroid derangement represents a second abnormality in the metabolism of this steroid in thyroid dysfunction. The previously known abnormality—namely, the alteration in plasma concentration of cholesterol—is a change, the opposite in direction to the present biliary findings. The mechanism responsible for both the biliary and the plasma changes of cholesterol concentration in thyroid derangement is now under investigation.

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Notes on the Strontium Content of Sea Water, Celestite Radiolaria, and Strontianite Snail Shells[1]

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I. The strontium value of sea water has been in doubt because of the wide range in reported values. The values of strontium in mg/l for a salinity of 35 parts/mille as reported by different workers with different methods are as follows: Desgrez and Meunier (*1*), 8.7; Thomas and Thompson (*2*), 13.2; Ramage (*3*), 40.–50.; Noll (*4*), 7.0–7.9; Miyake (*5*), 14.4; Vinogradov (*6*), 8.0; and Vinogradov (*7*), 10.0.

In the present study 235 determinations of Sr/Ca ratio have been made on 160 samples from diverse parts of the Atlantic, including samples in all seasons from Long Island Sound, deep samples from the middle Atlantic and opposite Gibraltar, and samples from the Gulf Stream.[2] Arc and flame spectrophotometric methods were used on single and double oxalate precipitations. The preferred value of atomic Sr/Ca ratio from these analyses is 9.23 atoms/1,000 atoms

[1] From a dissertation on The Biogeochemistry of Strontium, presented to the faculty of Yale University in partial fulfillment of requirements for the Ph.D. degree. The stimulating direction of G. E. Hutchinson is gratefully acknowledged.

[2] Collected by Bingham Oceanographic Laboratory and Woods Hole Oceanographic Laboratory and made available by G. A. Riley, E. F. Thompson, and Dean Bumpus.

Ca, which corresponds to 8.10 mg/l strontium in salinity of 35 parts/mille.

These analyses, when treated by analysis of variance, indicate that strontium is a conservative element varying with salinity. The total variation of the Sr/Ca ratio after analytical error has been removed is less than 8.4% for 95% of a group of analyses. The means of Ca/Cl and Mg/Cl ratios quoted by Thompson and Wright (*8*) have about the same variation, with 4.15% and 6.9% deviation at the 5% probability level. Thus a trace element such as strontium is not necessarily nonconservative in the ocean.

TABLE 1

ANALYSIS OF *Acanthometra*
(Percentage of ash)

	Ca and Sr	SO_4	R_2O_3	SiO_2	Sr*	Ca*	Loss
	17.3	—	1.3	6.0	—	—	—
	18.5	—	—	6.4†	—	—	—
	16.5	—	.5	27.8†	—	—	—
	25.1	—	1.5	13.6	—	—	—
	—	38.7	—	5.8	—	—	—
	—	41.2	—	.4	—	—	—
	—	> 31.	—	1.2	—	—	—
	—	—	—	—	28.1	.8	—
Mean:	19.4	36.9	1.1	8.7	—	—	33.9
Gravimetric analyses by Scheviakov (*17*):							
	22.5	—	17.6	21.6	—	—	29.6

* Spectrophotometric analysis.
† Silica determined with HF.

The analyses of this study roughly confirm the strontium values reported by Desgrez and Meunier, Noll, and Vinogradov as being close to the correct value. Since Miyake's method was a gravimetric separation method and therefore less reliable (*9*), and since Thomas and Thompson have never published any details or data, the overwhelming weight of all evidence places the strontium content of sea water at about 8.1 mg/l. This is considerably lower than the value of 13 mg/l being used in some reference books (*10–12*).

II. Although celestite was suggested by Müller (*13*) in 1858 as the substance of crystals found in *Collosphaera*, a radiolarian, Bütschli's (*14*) investigations in 1906 first demonstrated the celestite nature of the skeletons of radiolaria in the suborder Acantharia. Although this finding was supported by further evidence (Popofsky [*15*], Schmidt [*16*]), that the skeleton was celestite was never completely certain because the chemical analyses made of *Acanthometra pellucidum* by Scheviakov (*17*) were held to indicate that the skeleton was composed of calcium aluminum silicate. The issue is clearly stated by Hutchinson (*18*).

In the present study a plankton sample of *A. pellucidum* (sp. ?) from the Atlantic[3] was analyzed gravimetrically, spectrophotometrically, and with x-ray powder pattern methods.[4] The diffraction pattern was identical with that of celestite. The results of the chemical analyses are shown in Table 1, with the analyses reported by Scheviakov (*17*). The results are very rough because of the small amounts of material that were available for manipulations. They support the conclusion from the x-ray patterns that the main mineralogical crystal form present is celestite. What Scheviakov's figures mean is still uncertain. Also obscure is the physiology of the deposition of celestite.

[3] Collected by the Bingham Oceanographic Laboratory. Species identification is not completely certain.

Incidentally, a curious error has crept into some standard references (*10–12*). The radiolaria were described as having a skeleton of strontium *carbonate*, although apparently no original worker has really maintained this.

III. In the course of experiments in which snails (*Physa*) were raised in culture bottles with varying strontium concentrations, snails were raised with shells of more than half strontianite. The Sr/Ca ratio in the shells was about one third the Sr/Ca ratio in the aquatic culture medium. The visible appearance was similar to that of normal aragonite shells.

X-ray diffraction demonstrated that the shells with high strontium contained tiny crystals of both aragonite and strontianite, instead of an isomorphous intermediate of a substitution series. A diffraction pattern of an artificially mixed powder of strontianite and aragonite was nearly identical with the diffraction pattern of the shells. There were lines of both crystal species present.

The inducement of high strontium in the calcareous skeletons of organisms described above is not without precedent. Papillon (*19*), König (*20*), Stoeltzner (*21*), and Kinney and McCollum (*22*) produced up to 10% strontium content in bones of rats fed on high strontium. Wheeler (*23*) produced eggshells high in strontium by feeding chickens high strontium food. Robison and Rosenheim (*24*) produced deposition of bone salts in bone tissue culture experiments by introducing a medium high in strontium.

[4] Grateful appreciation is expressed to Horace Winchell, of the Brush Mineralogical Laboratory, Yale University, for use of x-ray facilities, and to James Clark for the first determination.

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Vitamin B_{12} in Activated Sewage Sludge[1]

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During studies of the biological oxidation of dairy wastes, it occurred to us that the mixed microflora might contain significant quantities of vitamin B_{12}. Further investigation confirmed this idea, and led us to test the vitamin B_{12} content of aerator sludge from a municipal sewage treatment plant. The apparent vitamin B_{12} content shown by direct assay with *Lactobacillus leichmannii* ATCC 4797 was determined essentially by the method of Skeggs, *et al.* (*1*). Since such activated sludge could be expected to contain almost any product of plant or animal metabolism, it was tested further by alkaline destruction of vitamin B_{12} (*2*) and chromatographic separation on paper from other materials which stimulate the growth of the test organism (*3*).

The amount of vitamin B_{12} indicated by the alkaline destruction procedure (Table 1, col. 4) was about that shown by chromatographic separation (not tabulated). Materials stimulating the growth of *L. leichmannii* which had R_F values of about 0.4, presumably thymidine, and 0.8 made up the major part of the components which move more rapidly than vitamin B_{12} complex. Essentially the total activity shown by the direct assay was given by the sum of the various components separated chromatographically. These data indicate that the alkaline destruction method is a satisfactory measure of the vitamin B_{12} activity of these preparations for *L. leichmannii.*

TABLE 1

VITAMIN B_{12} CONTENT OF ACTIVATED SLUDGE
(All Data Calculated on Moisture-Free Basis)

1	2	3	4
Sample	Apparent B_{12} (μg/g)	Alkali-stable growth factors (as B_{12}) (μg/g)	Vitamin B_{12} (by diff) (μg/g)
Dairy waste sludge			
Wet	8.8	1.5	7.3
Municipal sewage sludge			
Wet	9.7	0.4	9.3
Lyophilized	6.7	.4	6.3
Dried for 24 hr at 105° C	4.0	.4	3.6
Dried for 24 hr at 70° C in circulated air	7.0	.4	6.6
Dried, under vacuum, on steam drum	2.7	.3	2.4
Commercial product			
Sample A	3.2	0.4	2.8
Sample B	6.4	2.0	4.4

A vitamin B_{12} content of 1.5 mg/lb (3.3 μg/g) has been proposed by the Association of American Feed Control Officials as a required level for a commercial feed supplement. If the minimum values are considered (Table 1, col. 4), the amount of vitamin B_{12} in the samples dried under mild conditions was well above that required. A commercially available dried sludge contains similar significant amounts of vitamin B_{12}.

The existence of such a large potential supply of vitamin B_{12} in activated sludge is important, for dried sludge has heretofore been of value only as a fertilizer. Chick feeding tests are now being conducted at Beltsville, Maryland, by Herbert R. Bird, Bureau of Animal Industry, U. S. Department of Agriculture.

[1] Report of a study made under the Research and Marketing Act of 1946.

[2] We wish to acknowledge the cooperation of J. C. Lewis, Western Regional Research Laboratory, in making the initial tests, and of Robert P. Bolenius, superintendent of the Abington Township (Pa.) Sewage Treatment Plant, for collecting experimental material.

[3] One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

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Gordon E. McCallum has succeeded **Robert H. Flinn** as chief of Health Emergency Planning, USPHS. Mr. Flinn is on assignment to the Civil Defense Administration. Mr. McCallum holds the rank of sanitary engineer director in the Public Health Service.

Austin Smith, editor of the *Journal of the American Medical Association,* has accepted appointment as a member of the surgeon general's committee of consultants for the study of the indexes to medical literature, published by the Army Medical Library.

Comments and Communications

Origins of Scientists

No doubt the preliminary announcement by Knapp and Goodrich (*Science,* **113,** 543 [1951]) will arouse a good deal of comment. A question of interest may be the double-barreled criterion set up for the index, involving *both* a doctorate level *and* listing in *American Men of Science.* No reason is apparent why a listing in *American Men of Science* should not be the sole criterion. The double requirement given tends rather strongly to limit the field of inquiry to educational activities. A preliminary spot check of the listings in the current edition of *American Men of Science* indicates 68% with Ph.Ds., 10½% with Master's degrees, and 21½% with Bachelor's degrees only. Thus, to include everybody listed, the over-all total productive index would need to be increased by about 47% above the figures given in the article.

The writer lacks adequate data to indicate the extent to which the use of the listing only would change the comparative results, but it seems probable that a material bias attaching disproportionate importance to academic pursuits would be eliminated. The guess is ventured that, in a very real and practical sense, those listed in *American Men of Science* and holding only Bachelor's degrees are entitled to just a little more credit for their achievement than the Ph.Ds.

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Rats in Relationship to Man's Welfare[1]

This series of films has made available for the first time a comprehensive coverage of the biology of rats in its relationship to man's welfare. They cover *Rattus norvegicus,* the Norway rat, and *Rattus rattus,* the roof rat. Filming was by the U. S. Army Signal Corps in collaboration with the U. S. Public Health Service. The primary purpose of the films is to aid in the training of members of the Armed Forces and others engaged in work in the fields of health, sanitation, and rodent control.

The films should be of general interest however, to many persons other than the groups for which they were primarily intended. Even the general presentation of the activities of rats, which are shown in these films, will be an eye-opener to those who have only worked with the laboratory breeds.

The first film sets the stage with a very brief presentation of habits of rats, with particular reference to the role of rats in transmitting disease to man. There follows a pictorialization of the cycle of transmission of such rat-borne diseases as food poisoning, Weil's disease, murine typhus, and plague. Interspersed through the film are brief scenes of the type of economic damage done by rats.

The second and third films of the series lay the groundwork for a thorough knowledge of the ecology of the rat, which is essential both for an understanding of the transmission of rat-borne diseases and for instituting control measures. Particular emphasis is placed on the life cycle of rats with respect to attainment of their basic needs, the obtaining of food and harborage, and the fulfillment of the reproductive process. Also illustrated is how the restriction of the opportunity of realizing any of these needs leads to intraspecific competition. Well documented are the several types of harborage and sources of food that rats utilize. Considerable time is devoted to routes of travel between established sources of food and harborage. In so doing there results a good coverage of manual ability and orientation. Construction of nests and burrows, mating behavior, birth of young, transportation of food, and both intra- and interspecific competition are also covered.

The final four films on sanitation techniques, ratproofing, killing, and ectoparasite control continually emphasize the need of a full appreciation of the ecology of rats in instituting proper control measures. The outworn concept of killing as a panacea is replaced by the concept of killing as a sometimes necessary temporary remedial measure, which must always be accompanied by appropriate sanitation and ratproofing procedures. Ratproofing refers to the placing of barriers to travel, to ingress or egress from buildings, or to access to sources of food or harborage. Sanitation here refers to the removal of as many sources of food and harborage as feasible, along with their disposal in such fashion as not to foster residual foci of rat populations. Such policies of restricting rat habitats lead to intraspecific competition and occasional emigration, with eventual death of sufficient numbers so that rats are no longer a health hazard, or an important factor in producing economic loss. All phases of these control procedures are amply documented.

Purely from the viewpoint of the quality of the photography, these films rank with the best that have been produced in the way of wildlife moving pictures. One might wonder how it was possible to secure such extensive films of rats, which are both nocturnal and notoriously wary animals. Rats readily become ad-

[1] Released by the Department of the Army Medical Illustration Service, Armed Forces Institute of Pathology, Washington 25, D. C.

Number	Title	Running Time (Min)
TF 8-1669	The Rat Problem	26
TF 8-1670	Habits and Characteristics of the Rat, Part I, Norway Rat	28
TF 8-1671	Habits and Characteristics of the Rat, Part II, Roof Rat	14
TF 8-1672	Sanitation Techniques in Rat Control	22
TF 8-1673	Practical Rat Control—Ratproofing	19
TF 8-1674	Practical Rat Control—Killing	37
TF 8-1675	Rat Ectoparasite Control	12

All are black-and-white 16-mm sound films.

justed to the intense light necessary for photography so long as they are in familiar surroundings. The most difficult problem to surmount was sound. Rats would scurry for cover at the least whir of a camera or sound of a human voice. By the continuous use of a nonsense sound track at high volume, all extraneous noises were drowned out, and the rats went about their normal activities. Three types of movies were produced: (1) Rats in their native surroundings; (2) sets of houses, etc., were superimposed upon the native surroundings of rats; (3) rats were introduced into prepared sets. In this latter case rats were induced to act by first letting them become familiar with the set and, second, by shooting the scenes when the rats were at the height of their activity cycle.

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Geode Note

IN 1940 the writer presented a new working hypothesis to account for the formation of geodes, which are found so abundantly in the Warsaw and Keokuk formations. It was suggested that these "geodes were syngenetically deposited on the sea bottom as colloidal masses of hydrated silica" (*Trans. Illinois State Acad. Sci.*, 33, 168 [1940]) and that later, when the colloidal masses were in an environment where moisture was removed from the sediment or sedimentary rock, the loss of water from the gel produced the chalcedony shell that forms the outer layer of the geodes in those formations.

Geological evidence presented at that time has multiplied through the ensuing years to favor this hypothesis. Perhaps the most striking is offered by contact geodes. Not infrequently two geodes are found with a flat plane of contact and with a hollow in each geode. It is difficult to see how such pairs could be formed by any processes involving solution of cavities and subsequent filling, but it is understandable that colloidal masses coming in contact could produce a flat common surface and that each eventually dried and left its own cavity.

In 1944, a second paper (*Trans. Illinois State Acad. Sci.*, 37, 93 [1944]) showed that it was possible experimentally to produce silica gel balls under conditions very distantly approximating natural conditions. These, on being dried, gave shells not unlike the chalcedony shells of geodes.

There have been two questions that have never been satisfactorily answered: (1) By what process could colloidal silica, in such form and at such concentrations as is normally carried into the sea by rivers, become coagulated into stiff enough gels to form geodes, as postulated by this working hypothesis? (2) By what process are the quartz crystals, which line the majority of the geodes in the Warsaw and Keokuk formations, developed?

The first of these questions remains unsolved. However, the same question can be raised in considering how primary chert could have been deposited in the ocean, and if that question can be settled, the problem of the balls of stiff silica gel could probably be settled also. At present, studies are in progress of conditions that quite closely approximate those found in nature, and that could produce silica gel in sea water, and they may furnish light on the problem of chert and geode formation.

Regarding the formation of the crystals, it was suggested in our original paper that "loss of electrons produces a condition favoring deposition of crystalline quartz." This idea has been completely abandoned. Work by Richard Naken in Germany (A. C. Swinnerton. *Report of Investigation in European Theater*, Signal Corps Engineering Laboratories, Bradley Beach, N. J. [Jan. 1946]), by Buehler and Walker in this country (*Sci. Monthly*, 69, 148 [1949]), and by others has suggested a new line of procedure, which is now being investigated to determine if it is possible to develop quartz crystals on the inside of chalcedony shells similar to geodes, and under conditions that are similar to those found in nature.

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La Cellule Nerveuse

THE purpose of this note is to draw attention to an excellent, but not well-known, source of information concerning early work in neurocytology. The book referred to is *La Cellule Nerveuse*, by M. G. Marinesco (Vols. 1 and 2, published by O. Doins et Fils, Paris, in 1909). These volumes are Nos. 10 and 11 in a series known as the "Bibliothèque de Physiologie," published under the direction of J. P. Langlois. The edition was probably small, judging from the few copies in medical libraries and the infrequent reference to this classical treatise in current reports of neuroanatomical research.

Volume 1 of *La Cellule Nerveuse* deals exhaustively with the normal neuron. Volume 2 is concerned, in equal detail, with the cytology of experimentally and pathologically altered neurons. The book is not impressive physically, and the illustrations are of only fair quality. However, the text material will be a delight to every student of the nervous system, especially since many of the original sources are now inaccessible because of actual scarcity or language difficulties. A few branches of science are based on such new concepts and techniques that the older literature is of little interest. This is not the case with neuroanatomy. No present-day student in this field can afford to ignore the brilliant and meticulous work done in Europe more than half a century ago. *La Cellule Nerveuse*, together with Cajal's better known *Histologie du Système Nerveux de l'Homme et des Vertébrés*, are major chapters in the neurocytologist's Old Testament.

To learn of the availability of *La Cellule Nerveuse*, a query was directed to 104 member libraries of the

Medical Library Association, with the following results:

Great Britain: Seven replies, one copy at the National Institute for Medical Research.

Canada: Eleven replies, one copy at the University of Ottawa, another at the University of Western Ontario.

United States: Eighty-five replies, copies being located in the following institutions: University of Oregon, Harvard, Army Medical Library, Boston Medical Library, Columbia (two copies, medical and psychology libraries), New York Academy of Medicine, University of Pittsburgh, Johns Hopkins, University of Louisville, Northwestern, University of Pennsylvania, St. Louis University, and the Wistar Institute.

This survey indicates that only about 15% of medical libraries are fortunate enough to possess a copy of Marinesco's valuable book.

The copy in the University of Western Ontario library was a gift from the private library of the late A. B. Macallum, Sr. The gift of any copies now in private hands to a university not listed above would be a contribution to neuroanatomical research.

MURRAY L. BARR

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Account Balanced

THE Committee Supporting the Bush Report was organized under the chairmanship of the late Isaiah Bowman, to work for the passage of suitable legislation on a National Science Foundation. During its operations the committee solicited and received voluntary contributions from many hundreds of persons in all fields of science. A small sum remained unexpended, and the Executive Committee voted to contribute it to the National Science Foundation through the director, Dr. Waterman. The Foundation has accepted the contribution and given permission for publication of the covering correspondence.

HOMER W. SMITH

March 26, 1951

Dr. Alan T. Waterman
National Science Foundation
Washington, D. C.

DEAR DR. WATERMAN:

On behalf of the Committee Supporting the Bush Report, of which the late Isaiah Bowman was chairman, we want to extend to you and the newly created National Science Foundation our heartiest congratulations.

A balance of $512.36 remains unexpended from a sum that was raised by subscription from scientists and friends of science throughout the country for the purpose of expediting the passage of satisfactory National Science Foundation legislation.

We would be happy to have the National Science Foundation accept this unexpended balance, to be spent by the Foundation without restrictions.

Yours sincerely,
BORIS A. BAKHMETEFF
CARYL P. HASKINS
HOMER W. SMITH
BETHUEL M. WEBSTER

April 16, 1951

Dr. Homer W. Smith
New York University College of Medicine
New York, N. Y.

DEAR DR. SMITH:

I wish to acknowledge receipt of your letter of March 26, 1951, transmitting the unexpended balance, $512.36, of a sum raised by subscriptions from scientists and friends of science for the purpose of expediting the passage of satisfactory National Science Foundation legislation.

On behalf of the National Science Foundation, I am very pleased to accept this first contribution to the Foundation, to be spent without restrictions. The members of the National Science Board join with me in expressing our sincere appreciation and ask that you convey this message to the members of the Committee Supporting the Bush Report.

May I add my personal thanks for your message of congratulations.

Yours sincerely,
ALAN T. WATERMAN, *Director*

Meteorological Data in Ecology

THE interesting comments of Werner A. Baum (*Science*, 113, 333 [1951]) concerning the ecological use of meteorological temperatures serve to emphasize the need for a clearer understanding of the significance of meteorological data in ecology. The utility of such data is well established in microclimatic studies, but the relationship of microclimatic to microenvironmental research does not seem to have been sufficiently emphasized. The former is only an integral part of the latter. Thus ecology must deal with edaphic, aquatic, geographic, and physiographic aspects, in addition to the climatic or weather data of meteorology. To get basic material for ecology, the objective should be to follow the incoming radiation, its absorption and dissipation, and the effect it produces in all its ramifications. Thus ecology requires much more information than that provided by meteorology or microclimatology. It involves a much broader field.

The following steps suggest some of the items that should be quantitatively measured in providing ecological data in studying the microenvironment: (1) Incoming solar radiation, its intensity and duration; (2) reflection of sunshine from various surfaces upon which it impinges; (3) absorption of sunshine into soil, water, plants, and animals in the form of heat and light or other radiation; (4) reradiation as loss of heat and light; (5) temperatures at various places in air, water, soil, plants, or burrows of animals—specifically, at the ground surface at successive intervals downward in the soil and upward in the air and at various places in the bodies of plants, in water, in the burrows of animals, and elsewhere; (6) movement of air (wind), velocity, duration, and direction at different points—e.g., next to the ground, among the vegetation, and above the vegetation; (7) precipitation, liquid or solid, and its ramifications; (8) relative humidity at various places—near the ground, among

the vegetation, and above the vegetation; (9) soil moisture at various depths underground; (10) evaporation from different kinds of surfaces; (11) barometric pressures.

Since such complete data are not usually available, it becomes necessary to use all the meteorological information possible and to supplement it by special records for ecological purposes. It would be a great saving in time and energy if these data could be automatically recorded on multiple-recording drums so that the values of each factor could be readily observed in simultaneous relation to others. In addition to its labor-saving value, it should also lead to clearer recognition of correlations and divergencies among the various factors that might help explain the dynamics of ecology.

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Book Reviews

Theory of Electrons. L. Rosenfeld. Amsterdam: North-Holland Pub.; New York: Interscience, 1951. 119 pp. $2.25.

This book is a revised and extended version of what must have been a most stimulating seminar for advanced graduate students of physics. It presents the foundations of the classical atomistic theory of the electric, magnetic, and optical properties of matter in a clear, careful way, in a brief 119 pages, by assuming that the reader has a considerable background in physics and mathematics, including analytical mechanics, statistical mechanics, and Maxwell's theory of the electromagnetic field. A summary of tensor notation is provided in an appendix.

The first chapter gives a brief historical review of the discoveries that led to the modern picture of the electrical constitution of atoms. The second is devoted to an unusually careful derivation of Maxwell's equations in matter by averaging over the charge and current distributions of the constituent atoms, electric quadrupole terms being retained. The third chapter deals with the dynamical properties of systems of charge, including Larmor's theorem and the gyromagnetic effects. The fourth chapter, on the magnetic properties of matter, is necessarily rather sketchy (even though the limitation to classical ideas is somewhat relaxed), but it forms a clear and attractive introduction to the field.

The last two chapters take up half of the book and form its most characteristic and valuable part. A brief discussion of the polarization of an atomic system by a constant field leads into a presentation of the elementary theory of dispersion. The remaining pages are devoted to clarification and refinement of the concepts thus introduced. Radiation damping is discussed, and its effect on the extinction coefficient of light scattered by a gas. This same contribution to the extinction coefficient is then derived from a quite different point of view, that of light scattering by a medium in which there are fluctuations in density. Ornstein and Zernike's theory of critical opalescence is presented. Finally, the book culminates in a rigorous theory of dispersion that takes account of both radiation damping and density fluctuations, and ties together the preceding material in a beautiful way.

This book is to be recommended, on both scientific and aesthetic grounds, to advanced students of physics and to those who teach them.

HUBERT M. JAMES

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Amino Acids and Proteins: Theory, Methods, Application. David M. Greenberg, Ed. Springfield, Ill.: Thomas, 1951. 950 pp. $15.00.

The editor of this monograph has had the assistance of 17 contributors who have prepared 11 of the 13 chapters. In a beautifully printed and well-illustrated, although uncomfortably heavy, volume the amino acids and proteins are described and discussed from many points of view. The first 4 chapters deal with the properties of amino acids, the analytical methods used for their determination, their preparation by synthetic methods, and their isolation from proteins. The chapters following are devoted to the classification, purification, and isolation of proteins, to determination of their molecular size, to their amphoteric properties, and to criteria for judgments regarding the purity of individual preparations. The final chapters discuss the chemical reactions of proteins, their nutritive properties, antibodies, the biochemical significance of proteins, and the metabolism of proteins and amino acids.

Emphasis is placed throughout on methods, but the contributors have interpreted their assignment in widely different ways. For example, the chapter on the synthesis of amino acids gives, by means of chemical equations, the reactions that have been used to prepare these substances, together with brief statements on the procedures and references to their origin. However, the reader can rarely tell whether the reaction described has mere historical interest today, or whether it is the procedure he would be well advised to employ if he were assigned the problem of preparing a small sample or a large stock of the substance. To assist him in his choice, there is little in-

formation on yields or purity of product, or upon the conditions essential for success.

On the other hand, Chapter V gives a good general discussion of methods for the preparation of proteins and ends with specific and detailed descriptions of procedures whereby some 20 representative proteins may be obtained, many of them in crystalline form. In a later chapter are complete directions for the use of the Tiselius apparatus in determining diffusion constants, and, in still another chapter, a full description of the use of this device to determine mobilities.

Perhaps the least satisfactory section of the book is that on the isolation of amino acids from protein hydrolysates. The methods are given only in outline, so that reference to the original literature is necessary if use is to be made of them, and, as in the chapter on synthesis, there is little to indicate which of the various methods mentioned is to be preferred.

It is stated on page 5 that the new nomenclature for the amino acids, in particular the small capital letter prefixes for configurational relationship of these substances, is to be used throughout the book. Nevertheless, beginning on page 6 and almost consistently thereafter, *large* capital letter prefixes are used. To be sure, a small capital letter prefix is to be found here and there, and on page 70 both small *and* large capitals occur. This is apt to prove confusing to students, who may well wonder which is correct.

The book is thus somewhat disappointing in spite of the excellence of many chapters and the great amount of accurate and useful information about proteins and amino acids. There is much that is newly presented in textbook form. A number of tables offer information that would be difficult to find elsewhere. The student who reads it will indeed have acquired a fairly broad view of the subject, but he may frequently have to check back to the original literature to be sure of details.

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Reviewed in Brief

The Growth of Physical Science. 2nd ed. Sir James Jeans. New York: Cambridge Univ. Press, 1951. 364 pp. $3.75.

The second edition of the posthumous work of the late Sir James Jeans, first published in 1947, has been brought up to date by correcting a number of misprints in dates and names as well as by including findings that had been overlooked by the author, who did not live to see his book in print. This edition, prepared by P. J. Grant, of the Cavendish Laboratory, can be highly recommended to teachers of physics and scientists in the neighboring fields who want to get an insight into the development of the physical sciences.

A brief outline of the physical sciences in antiquity is followed with a more detailed account of Greek mathematics, physics, philosophy, and astronomy. The sciences in Alexandria are discussed, followed by a short description of science in Islam and in Europe during the Dark Ages. This then leads to the most important chapters: science during the Renaissance and the period from 1600 to 1700, called by Jeans "the century of genius." The two centuries after Newton are treated briefly, and the book closes with a chapter on modern physics covering the theory of relativity, the electrical structure of matter, quantum theory, and some modern astronomy, as well as experimental development in various fields of physics, including nuclear physics.

The easy style and clarity of description will make this a welcome edition for both students and teachers.

Methods in Medical Research, Vol. 2. Julius H. Comroe, Jr., Ed. Chicago: Year Book Pub., 1950. 361 pp. $6.50.

This is the second in a series of volumes devoted to methods and techniques. The contents are grouped into three sections: "Methods of Study of Bacterial Viruses," "Pulmonary Function Tests," and "Assay of Hormone Secretions." Sixty contributors and reviewers are responsible for the material presented. The methods are clearly outlined and will be of unquestioned value to workers in the fields covered. The book is lithoprinted.

Methods in Medical Research, Vol. 3. Ralph W. Gerard, Ed. Chicago: Year Book Pub., 1950. 312 pp. $7.00.

In the third volume, the same careful selection of material and clarity of presentation are maintained. The volume is divided into four self-contained sections with the following titles: "Genetics of Microorganisms," "Assay of Neurohumors," "Selected Psychomotor Measurement Methods," and "Methods for Study of Peptide Structure." Fifty-two contributors and reviewers prepared the material. The book can be highly recommended.

Scientific Book Register

Vorlesungen über Differential- und Integralrechnung: Differentialrechnung auf dem Gebiete mehrerer Variablen, Vol. II. A. Ostrowski. Basel: Verlag Birkhäuser, 1951. 480 pp. Sw. fr. 67, bound.

Substances Naturelles de Synthèse: Préparations et Méthodes de Laboratoire, Vol. I. Leon Velluz, Ed. Paris: Masson et Cie, 1951. 141 pp. 1,200 fr.

Annual Review of Plant Physiology, Vol. 2. Daniel I. Arnon, Ed.; Leonard Machlis, Assoc. Ed. Stanford, Calif.: Annual Reviews, 1951. 361 pp. $6.00.

The Birds of Greenland, Part II. Finn Salomonsen; illus. by Gitz-Johansen. Copenhagen: Einar Munksgaard, 1951. Pp. 159–348, with 18 plates. $9.00.

Physik und Chemie des Zellkernes. Protoplasma-Monographien, Band 20. Petr F. Milovidov. Berlin: Naturwissenschaftlicher Verlag, 1949. 529 pp.

Scientific and Learned Societies of Great Britain. 57th ed. London: Allen & Unwin; New York: Macmillan, 1951. 227 pp. $5.25.

Metallurgical Thermochemistry. O. Kubaschewski and E. Ll. Evans. New York: Academic Press; London: Butterworth-Springer, 1951. 368 pp. $6.00.

Collected Papers in Psychology. Edward Chace Tolman. Berkeley, Calif.: Univ. California Press, 1951. 269 pp. $4.50.

Advances in Biological and Medical Physics, Vol. II. John H. Lawrence and Joseph G. Hamilton, Eds. New York: Academic Press, 1951. 348 pp. $7.80.

Fundamentals of Horticulture: A Textbook Designed for Courses in General Horticulture. J. B. Edmond, A. M. Musser, and F. S. Andrews. Philadelphia: Blakiston, 1951. 502 pp. $5.50.

On the Origin of Species by Means of Natural Selection. Reprint of first edition. Charles Darwin. New York: Philosophical Library, 1951. 426 pp. $3.75.

Nature and Human Nature: Man's New Image of Himself. Lawrence K. Frank. New Brunswick, N. J.: Rutgers Univ. Press, 1951. 175 pp. $3.00.

Artificial Fibres. R. W. Moncrieff. New York: Wiley, 1950. 313 pp. $4.50.

Paracelsus: Magic into Science. Henry M. Pachter. New York: Schuman, 1951. 360 pp. $4.00.

An Index of Mediaeval Studies Published in Festschriften, 1865–1946: With Special Reference to Romanic Material. Compiled by Harry F. Williams. Berkeley, Calif.: Univ. California Press, 1951. 165 pp. $4.00.

The Elements of Mathematical Logic. Paul C. Rosenbloom. New York: Dover, 1950. 214 pp. $2.95.

Social Aspects of Illness. Carol H. Cooley, Philadelphia–London: Saunders, 1951. 305 pp. $3.25.

Association Affairs

The Seventh Philadelphia Meeting December 26–31, 1951

Raymond L. Taylor

Assistant Administrative Secretary

PLANS for the 118th meeting of the American Association for the Advancement of Science in the city where it was founded, in 1848, are proceeding on schedule. As forecast in the Preliminary Announcement (*Science,* **113**, 635 [1951]), there will be outstanding programs in every principal field of science. A new section, Section P—Industrial Science, overwhelmingly approved by a vote of the Council, will be inaugurated at this meeting.

Sectional Programs. All 18 of the Association's sections and subsections have developed plans for programs, largely of the symposium type. Sections also scheduling sessions for contributed papers include:

Section C—Chemistry, Ed. F. Degering, Buckman Laboratories, Inc., 1256 North McLean Street, Memphis 8, Tennessee

Section E—Geology and Geography, Leland Horberg, University of Chicago

Section G—Botanical Sciences, Stanley A. Cain, University of Michigan

Section H—Anthropology, Marian Smith, Columbia University

Section I—Psychology, Delos Wickens, Ohio State University

Subsection Nd—Dentistry, Russell A. Bunting, University of Michigan

Subsection Np—Pharmacy, Glenn L. Jenkins, Purdue University

Section Q—Education, Dean A. Worcester, University of Nebraska

Those who wish to read papers in one of the above sections should submit titles and abstracts to the respective secretaries before *September 30.* Most of the sectional programs will be held in Philadelphia's Municipal Auditorium, or "Convention Hall."

Programs of the Participating Societies. The details of the sessions of the societies meeting with the AAAS will appear at a later date. Most of these sessions will be in the downtown hotels, but exceptions include the symposium "Radioisotopes in Medicine," sponsored by the Oak Ridge Institute of Nuclear Studies; the demonstration sessions of the American Society of Zoologists; and the evening lectures of the National Geographic Society, Phi Beta Kappa, and Phi Kappa Phi—all of which are scheduled for Convention Hall or university auditoriums near by. The Convention Hall will also house the Main Registration and Information Center, the 150-booth Annual Exposition of Science and Industry, the AAAS Science Theatre, the Visible Directory of Registrants, a Holland-operated Restaurant, and the Biologists' Smoker.

LOCAL INSTITUTIONS PARTICIPATING IN THE PROGRAMS

Amateur Telescope Makers of The Franklin Institute
Bryn Mawr College, Department of Geology
City Planning Commission, City of Philadelphia
Drexel Institute of Technology, College of Engineering
Engineers' Club of Philadelphia
Fels Planetarium, The Franklin Institute
Pennsylvania Academy of Science
Philadelphia Botanical Club
Rittenhouse Astronomical Society
Swarthmore College, Division of Engineering
Towne Scientific School, University of Pennsylvania
University Museum, University of Pennsylvania
Villanova College, Department of Engineering

HOUSING AND REGISTRATION

The hotels of Philadelphia have pledged themselves to provide ample housing, at moderate rates, for those attending the 118th meeting. Housing will be handled by the Philadelphia Convention and Visitors Bureau. Special forms in triplicate that prevent errors and provide for "desired rate" and "maximum rate" will be used; confirmations will be made promptly. The large number of hotels cooperating ensures a wide latitude of choice.

Full-page announcements of these hotels, their rate schedules, and a coupon for room reservations will be found in the advertising pages of this issue of SCIENCE and in the September issue of THE SCIENTIFIC MONTHLY. Headquarters for the sections and participating societies follow:

HOTEL HEADQUARTERS

Bellevue-Stratford: (750 rooms) Broad & Walnut Sts.	AAAS; Press; AAAS Sections A, H, I, K, L, and Q; AAAS Cooperative Committee; Academy Conference; Biometric Society, Eastern North American Region; Society for American Archaeology; Society for Research in Child Development; American Home Economics Association, American Sociological Society, National Academy of Economics and Political Science, Pi Gamma Mu; Eastern Division of the American Philosophical Association, Philosophy of Science Association; American Association of Scientific Workers, American Library Association, Conference on Scientific Manpower, Honor Society of Phi Kappa Phi, National Association of Science Writers, Scientific Research Society of America, Sigma Delta Epsilon, Society of the Sigma Xi, Special Libraries Association, United Chapters of Phi Beta Kappa.
Benjamin Franklin: (1200 rooms) 9th & Chestnut Sts.	AAAS Sections F, G, N (including Subsections Nm, Nd, and Np), and O; American Society of Protozoologists, American Society of Zoologists, Herpetologists League, Society of Systematic Zoology; American Microscopical Society, American Society of Limnology and Oceanography, Beta Beta Beta, Ecological Society of America, Genetics Society of America; Botanical Society of America; Alpha Epsilon Delta; American Association of Colleges of Pharmacy, American College of Apothecaries, American Pharmaceutical Association, American Society of Hospital Pharmacists.
Adelphia: (400 rooms) 13th & Chestnut Sts.	National Association of Biology Teachers; National Science Teachers Association; American Nature Study Society.
John Bartram: (400 rooms) Broad & Locust Sts.	AAAS Sections B, C, D, and E; American Meteorological Society, Oak Ridge Institute of Nuclear Studies; National Geographic Society, National Speleological Society. (Register at Bellevue-Stratford or Convention Hall.)
Sylvania: (400 rooms) Locust St., near Broad	AAAS Sections M and P; American Industrial Hygiene Association. (Register at Bellevue-Stratford or Convention Hall.)

The following additional hotels are available for sleeping rooms:

Barclay (600 rooms), Rittenhouse Sq., E.
Drake (700 rooms), 1512 Spruce St.
Essex (225 rooms), 13th & Filbert Sts.
Penn Sheraton (600 rooms), 39th & Chestnut Sts.
Ritz-Carlton (200 rooms), Broad & Walnut Sts.
Robert Morris (200 rooms), 17th & Arch Sts.
St. James (125 rooms), 13th & Walnut Sts.
Warwick (900 rooms), 17th & Locust Sts.

Guests in these hotels should register at Convention Hall or the Bellevue-Stratford.

ADVANCE REGISTRATION

The Council of the Association favors retaining Advance Registration, which has obvious advantages—provided programs are not delayed by heavy preholiday mail. Last year's experiment of sending the 304-page General Program early in December by first-class mail was so successful that it will be done again this year. A full-page announcement on Advance Registration and an accompanying coupon will be found in the advertising pages of this issue of SCIENCE and in the September issue of THE SCIENTIFIC MONTHLY. Coupons for Advance Registration can be accepted through *December 6*. Facilities for registration at the meeting will open Wednesday, December 26. AAAS registration fees have not changed—they are still $2.00 for members, for husbands or wives of registrants, and for bona fide students; and $3.00 for nonmembers. An additional 25¢ for advance registration partly covers first-class mailing costs.

THE LOCAL COMMITTEE

It would be impossible to make successful arrangements for the large and complex meetings of the Association, to ensure the smooth operation of each session, to secure adequate local public information, and to finance the meetings without the very considerable personal services of members of the local committee, and they merit the unstinted appreciation of all who attend. At this time, the following have assumed definite responsibilities:

Honorary General Chairman: *Edward Hopkinson, Jr.*, Drexel & Co.

General Chairman: *James Creese*, president, Drexel Institute of Technology.

Executive Committee: *James Creese*, president, Drexel Institute of Technology, *chairman*; *Allen T. Bonnell*, vice president, Drexel Institute of Technology, *secretary*; *Henry B. Allen*, executive vice president and secretary, The Franklin Institute; *Walter H. Annenberg*, publisher, Philadelphia *Inquirer*; *George B. Beitzel*, president, Pennsylvania Salt Manufacturing Company; *Henry Bryans*, president, Philadelphia Electric Company; *Richard H. DeMott*, president, SKF Industries, Inc.; *Hugh W. Field*, vice president and general manager, Atlantic Refining Company; *John M. Fogg, Jr.*, vice provost, University of Pennsylvania; *Wilfred D. Gillen*, president, Bell Telephone Company of Pennsylvania; *Albert M. Greenfield*, president, Albert M. Greenfield & Company; *Edward Hopkinson, Jr.*, Drexel & Co.; *C. Mahlon Kline*, president, Smith, Kline & French Laboratories; *Harry A. Kuljian*, president, The Kuljian Corporation; *M. Albert Linton*, president, Provident Mutual Life Insurance Co.; *Thomas McCabe*, president, Scott Paper Company; *Richard T. Nalle*, president, The Midvale Company; *Charles S. Redding*, president, Leeds & Northrup Company; *E.*

W. Slocum, general manager, Philadelphia *Evening Bulletin*; and *Steven M. Spencer*, associate editor, Curtis Publishing Company.

Subcommittee on Exhibits: *Hugh W. Field*, vice president and general manager, Atlantic Refining Company, *chairman*; *Lycurgus Laskaris*, director, Crude Oil Production Division, Atlantic Refining Company, *secretary*; *L. Earle Arnow*, director of research, Sharp & Dohme, Inc.; *K. R. Brown*, vice president, Atlas Powder Company; *Foster C. Nix*, professor of physics, University of Pennsylvania; *S. C. Ogburn, Jr.*, manager, research and development, Foote Mineral Company; *Emil Ott*, director of research, Hercules Powder Company; *J. R. Sabina*, technical manager, Petroleum Chemical Division, E. I. du Pont de Nemours & Company, Inc.; *T. P. Simpson*, director of research and development, Socony-Vacuum Oil Company, Inc.; *I. Melville Stein*, executive vice president, Leeds & Northrup Company; *W. Furness Thompson*, vice president in charge of research, Smith, Kline & French Laboratories; *Charles S. Venable*, director of chemical research, American Viscose Corporation; *P. A. Wells*, director, Eastern Regional Laboratory, U. S. Department of Agriculture; and *W. E. Zieber*, director of research, York Corporation.

Subcommittee on Local Public Information: *Steven M. Spencer, chairman*; *Pierre C. Fraley*, science writer, Philadelphia *Evening Bulletin*; *Henry L. Herbert*, director of news bureau, University of Pennsylvania; *William F. Irwin*, executive secretary, Philadelphia County Medical Society; *Harold Le Duc*, vice president, Bell Telephone Company of Pennsylvania; *John M. McCullough*, staff writer, Philadelphia *Inquirer*; *Joseph F. Nolan*, medical editor, Philadelphia *Inquirer*; *G. F. Roll*, director of public relations, Smith, Kline & French Laboratories; and *John D. Scheuer, Jr.*, assistant general manager, Station WFIL–TV.

Subcommittee on Physical Arrangements: *John M. Fogg, Jr.*, vice provost, University of Pennsylvania, *chairman*; *Gladys Benner*, Philadelphia Board of Education; *Harold F. Bernhardt*, Temple University; *James A. Fowler*, Academy of Natural Sciences of Philadelphia; *William H. Gardiner*, supervisor, student agencies, University of Pennsylvania; *Mrs. Gloria C. Gossling*, The Franklin Institute; *Charles L. Parmenter*, University of Pennsylvania; *Hugh M. Shafer*, University of Pennsylvania; and *William A. Shaw*, University of Pennsylvania.

General Reception Committee: In addition to the foregoing, the following are members of the General Reception Committee: *J. Harold Austin*, executive secretary, College of Physicians of Philadelphia; *John R. Bates*, director in charge of research, Sun Oil Company; *H. K. Bauerfeind*, president, J. B. Lippincott Company; *Robert F. Beard*, vice president, McGraw-Hill Book Company, Inc.; *Charles Berwind*, president, World Affairs Council of Philadelphia; *Elmer K. Bolton*, formerly director, Chemical Department, E. I. du Pont de Nemours & Company, Inc.; *Horace M. Bond*, president, Lincoln University; *Mother Mary Boniface*, president, Rosemont College; *Francis Boyer*, executive vice president, Smith, Kline & French Laboratories; *Millard Brown*, vice president, Continental Mills; *Revelle W. Brown*, president, Reading Railroad; *Richard P. Brown*, chairman of board, Brown Instrument Company; *W. A. Buck*, vice president and general manager, Radio Corporation of America; *Edward G. Budd, Jr.*, president, The Budd Company; *Vincent L. Burns*, president, Immaculata College; *Martin W. Clement*, chairman of board, Pennsylvania Railroad Company; *Ralph Connor*, vice president of research, Rohm & Haas Company; *Clement V. Conole*, Chamber of Commerce of Greater Philadelphia; *John Curtin, Jr.*, president, Warner Company; *Jacob S. Disston, Jr.*, president, Henry Disston & Sons, Inc.; *William H. DuBarry*, executive vice president, University of Pennsylvania; *Joseph L. Eastwick*, president, James Lees & Sons Company; *E. W. Engstrom*, vice president, R. C. A. Laboratories; *Marion Fay*, dean, Woman's Medical College of Pennsylvania; *Clifford E. Frishmuth*, president, Supplee-Wills-Jones Milk Company; *E. E. Garrett*, general manager, Philadelphia Division, Gulf Oil Corporation; *A. A. Garthwaite, Sr.*, president, Lee Tire & Rubber Company of New York Inc.; *Thomas S. Gates, Jr.*, Drexel & Co.; *Emerson Greenway*, head librarian, Free Library of Philadelphia; *Ivor Griffith*, president and dean, Philadelphia College of Pharmacy & Science; *Orville F. Haas*, vice president, General Electric Company; *Bertrand W. Hayward*, director, Philadelphia Textile Institute; *R. B. Holmes*, general manager, Link-Belt Company; *Louis P. Hoyer*, superintendent of schools; *Frank K. Hyatt*, president, Pennsylvania Military College; *Edward G. Jacklin*, president, St. Joseph's College; *Robert Livingston Johnson*, president, Temple University; *James L. Kauffman*, president, Jefferson Medical College; *Ralph Kelly*, The Sheraton Hotel; *Ridgway Kennedy, Jr.*, president, Abbotts Dairies, Inc.; *Fiske Kimball*, director, Philadelphia Museum of Art; *Raymon M. Kistler*, president, Beaver College; *Edmund L. Lauber*, executive vice president, No Mend Hosiery, Inc.; *John Frederick Lewis, Jr.*, Lewis, Wolff and Gourlay; *Harry V. Masters*, president, Albright College; *Katharine E. McBride*, president, Bryn Mawr College; *Norman E. McClure*, president, Ursinus College; *L. T. McCurdy*, vice president, Container Corporation of America; *F. X. N. McGuire*, president, Villanova College; *William Meinel*, president, Heintz Manufacturing Company; *John McK. Mitchell*, dean, University of Pennsylvania School of Medicine; *David W. E. Morgan*, vice president, Westinghouse Electric Corporation; *John W. Nason*, president, Swarthmore College; *Leon N. Neulen*, superintendent of schools, Camden, New Jersey; *L. Stauffer Oliver*, president, Hahnemann Medical College & Hospital; *Brother G. Paul*, president, LaSalle College; *William H. Perkins*, dean, Jefferson Medical College; *F. N. Piasecki*, chairman of the board, Piasecki Helicopter Corporation; *Paul S. Pittenger*, vice president, Sharp & Dohme, Inc.; *J. Edgar Rhoads*, J. E. Rhoads & Sons; *Alfred N. Richards*, University of Pennsylvania, School of Medicine; *Harold E. Rice*, dean, Moore Institute of Art, Science & Industry; *Lawrence Saunders*, president, W. B. Saunders Publishing Company; *Marvin W. Smith*, executive vice president, Baldwin-Lima-Hamilton Corporation; *Harold E. Stassen*, president, University of Pennsylvania; *Henderson Supplee*, executive vice president, Atlantic Refining Company; *W. F. G. Swann*, director, Bartol Research Foundation; *A. W. Swartz*, president, Linear, Inc.; *Charles S. Swope*, president, West Chester State Teachers College; *Clarence Tolan, Jr.*, president, Dodge Steel Company; *Rudolph Voegler*, Chamber of Commerce; *Edward Warwick*, dean, Philadelphia Museum School of Art; *Martin D. Whitaker*, president, Lehigh University; *Gilbert F. White*, president, Haverford College; *George W. Whitwell*, vice president, Philadelphia Electric Company; *A. H. Williams*, president, Federal Reserve Bank of Philadelphia; *Leslie J. Woods*, vice president, research and engineering, Philco Corporation.

News and Notes

The Influence of Hormones on Enzymes: A Symposium

THE New York Academy of Sciences, Section on Biology, sponsored a conference on Influence of Hormones on Enzymes on June 5 and 6. The meetings, which were held in the auditorium of the New York Genealogical and Biographical Society in New York City, attracted more than 350 scientists. The program, arranged by R. I. Dorfman and E. D. Goldsmith, was planned primarily to bring together endocrinologists and enzymologists to review the present status of the work on the mechanism of hormone action. As a working hypothesis it has been assumed by many that hormones act by influencing enzyme systems. This influence may be exerted (1) by means of changes in tissue enzyme concentrations, (2) by the hormone functioning as a component of an enzyme system, or (3) by direct or indirect effects on accelerators and/or inhibitors of enzyme systems. A group of stimulating papers dealing with such hypotheses was presented.

The meeting was opened by C. D. Kochakian, who discussed the influence of steroid hormones on arginase concentrations in the organism. Testosterone increases rat kidney arginase concentration without influencing this enzyme in the liver tissue, and the increase continues even after the generalized protein anabolic effect of the hormone is no longer evident. Cortisone produced an increase in kidney arginase, as well as an increase in liver arginase, in contrast to the influence of testosterone on this enzyme system. Of further interest is the fact that cortisone stimulation of liver arginase concentration is increased only after the usual protein catabolic effect of cortisone is no longer in evidence.

W. H. Fishman and S. L. Cohen discussed the influence of hormones on β-glucuronidase concentrations in the tissues of various animals. Dr. Fishman pointed out that there is a definite relationship between estrogen and uterine β-glucuronidase concentrations. Following ovariectomy in female mice, the concentration of this enzyme in the uterus decreases and, when such animals were given estrogen, the enzyme concentration increased. This is also true for vaginal and mammary tissues (Dr. Cohen). In pregnancy one also sees an increased β-glucuronidase concentration in the serum. In C_3H mice estrogen stimulation produces an increased concentration of the enzyme in the liver without influencing kidney concentration. On the other hand, treatment of C_3H mice with androgens such as testosterone or Δ 5-methylandrostenediol-3(β), 17(β) results in a very great increase in kidney glucuronidase, whereas liver enzyme concentrations are unaltered. The influence of androgens on kidney glucuronidase may be prolonged by continued administration of hormone for as long as 70 days, at which time, with high doses of androgens, the kidney β-glucuronidase concentration may be increased as much as fifty-fold. Dr. Cohen emphasized the fact that β-glucuronidase concentrations in tissues of animals vary greatly —by a factor as large as 30 in mammary tissues. He also called attention to the inverse relationship that exists between the glucuronidase and esterase concentrations of tissues; namely, that a low concentration of β-glucuronidase is associated with a high concentration of esterase, and vice versa. He confirmed the findings of Dr. Fishman concerning the interrelationship of estrogens and β-glucuronidase concentrations in sex-specific tissues. Progesterone was studied by Dr. Cohen and found to cause a reduction in the β-glucuronidase activity of both sexual and nonsexual tissues in mice. Cortisone and stress conditions were shown to be associated with an increase in serum glucuronidase and a decreased serum esterase. Preliminary observations indicated a direct relationship between the levels of serum β-glucuronidase and the proportion of urinary ketosteroids excreted as glucuronide conjugates.

The influence of steroid hormones of various oxidases was reported by several investigators using both *in vitro* and *in vivo* techniques. W. W. Umbreit presented evidence indicating that concentrations of D-amino acid oxidase, as well as proline oxidase, in tissues are under the control of adrenal cortical hormones. Specifically in studies of adrenalectomy and treatment with cortisone, he was able to show that the two oxidases are decreased in specific tissues in adrenalectomized animals and their concentrations restored to normal after treatment with cortisone. Whereas cortisone appears to control the concentration of liver D-amino acid oxidase, the hormone was without effect on the kidney enzyme concentration. On the other hand, proline oxidase of kidney was controlled by cortisone, whereas the liver enzyme was independent of adrenalectomy and cortisone treatment. Of further interest was the finding of an increased requirement for adenylic acid and ATP in the tissues of adrenalectomized animals. This alteration can be restored to normal by cortisone treatment.

M. Hayano and R. I. Dorfman described *in vitro* effects of steroids on the partially purified D-amino acid oxidase system, showing that many steroids, particularly desoxycorticosterone, at low concentrations are capable of inhibiting the enzyme. The inhibition has been found to be reversible and noncompetitive. The action of the steroid appears to be on the surface of the apoenzyme and does not influence the prosthetic group.

H. Jensen described *in vitro* and *in vivo* effects of the amino acid oxidase system. Like Dr. Umbreit, he found that adrenalectomy or thyroidectomy reduces the concentration of the amino acid oxidase in the liver. Dr. Jensen's finding that adrenalectomy decreased the amino acid oxidase of kidney, however, is at variance with the observations of Dr. Umbreit. Dr. Jensen pointed out that the activity of amino acid oxidase in kidney, but not in liver, may be influenced by amino acid concentrations in the blood.

J. H. Quastel discussed the influence of steroid hor-

mones on the α-glycerophosphate dehydrogenase system prepared from yeast. Using a new manometric technique involving MNO_2 as terminal acceptor, he and Dr. Hochester found an inhibition in an *in vitro* system with various ketosteroids, the most active being those possessing a 3-ketone group. The inhibition could be demonstrated anaerobically or aerobically. Of particular interest is the fact that brain homogenates added to the reaction mixture reversed the steroid inhibition.

The work on the effects of castration on brain metabolism or brain respiration was reviewed by G. S. Gordan, who pointed out that androgens tend to suppress brain respiration. Castration in the rat increases respiration of brain tissues, probably by the mechanism of release of some inhibitory substances. This increase can be reversed by either the *in vivo* administration of testosterone or by the *in vitro* addition of this compound to the test system. This investigator also studied the influence of desoxycorticosterone glucoside on cerebral blood flow, respiration, and carbohydrate metabolism. As a result of desoxycorticosterone glucoside stimulation *in vivo* in man, he found an increased carbohydrate concentration in the venous blood from the brain, which is believed to be due to galactose originating in the cerebrosides. The release of the galactose from the cerebrosides was evident within 7 minutes of the intravenous hormone administration. This finding is particularly significant with respect to the high rate of metabolism of cerebrosides, heretofore thought to be components of a sluggish metabolic system.

H. A. Lardy and Gladys Feldott studied the *in vitro* metabolism of glutamic acid and β-hydroxybutyric acid, both of which appear to be at least in part controlled metabolically by thyroxin. Glutamic acid metabolism by rat kidney homogenate in the presence of Krebs' cycle intermediates was inhibited by thyroxin in concentrations as low as 10^{-6} molar. A partial reversal of this inhibition could be produced by the addition of coenzyme I, ATP, and cytochrome *c*. Compounds biologically related to thyroxin also inhibited this system in direct proportion to their biological activity in the intact animal. The oxidation of fatty acids and β-hydroxybutyric acid by washed residues from rat kidney was stimulated by thyroxin.

The effects of the hyperglycemic factor of the pancreas, as well as epinephrine, on synthesis and breakdown of glycogen was discussed by E. Sutherland. He presented evidence that both these hormonal factors influence the breakdown of glycogen to glucose phosphate by their influence on the phosphorylase system in liver. He found that the hyperglycemic factor and epinephrine increased the concentration of active phosphorylase in liver slices, and that epinephrine also increased the amount of active phosphorylase in isolated rat diaphragms. He further pointed out that neither of these two hormones altered the phosphate permeability.

M. E. Krahl discussed the influence of hormones on the metabolism of carbohydrates by the diaphragm muscle. He showed that hypophysectomy or hypophysectomy and adrenalectomy increased the glucose uptake in the tissues, suggesting an increase in the rate of the hexokinase reaction. He further demonstrated that glucose uptake by muscle could be inhibited by a pituitary factor, and that this pituitary factor appears to be similar to, though probably not identical with, the growth hormone. Insulin stimulates the uptake of glucose in the diaphragm muscle experiments, indicating a stimulatory action on the hexokinase system. Dr. Krahl's experiments show that the hexokinase system in muscle is controlled by at least three hormones: an anterior pituitary hormone, the adrenocortical hormone, which appears to be inhibitory, and insulin, which is stimulatory.

W. C. Stadie has also studied certain aspects of the influence of insulin on *in vitro* systems. Three basic points seem to be indicated from Dr. Stadie's experiments: first, that the hormone needs the intact cell for its action; second, that the insulin adheres to the cell wall, probably involving a binding; and, third, that the insulin cell combination is influenced by various factors such as pituitary hormones and the nutritional state of the animal. The combination of insulin is not restricted to any specific tissues, since combinations can be demonstrated with muscle, adipose, and mammary tissue. A specific factor affecting the action of insulin appears to be a pituitary factor other than the growth hormone or ACTH, which inhibits the action of insulin.

E. M. MacKay reported that insulin causes a marked increase in the rate of oxidation to carbon dioxide in the eviscerated rabbit. When this is measured with a C^{14}-labeled sugar, the glucose passes through a large metabolic pool, for the most part a water-soluble fraction. Fasting diminishes the effect of insulin measured by C^{14}-compounds. The glucose and sorbitol spaces in the body are essentially the same as those of the extracellular fluid. Insulin is without influence upon the volume occupied by either.

Studies on the influence of hormones on ketogenesis were carried out and reported by J. and H. M. Tepperman. Hypophysectomy in the rat results in a decreased rate of formation of ketone bodies by liver slices. Operated animals treated within the first 15 days with growth hormone show a restoration of the liver slices to produce ketone bodies. After about 30 days, treatment of the hypophysectomized animals with growth hormone is without effect—that is, the ketone body formation by liver slices is definitely decreased. Thirty days after the hypophysectomy, administration of cortisone results in a slight restoration of ketone body production. However, treatment of hypophysectomized animals with both cortisone and growth hormone even 50 days or more postoperatively produces normal ketone body production by liver slices. *In vitro* studies were reported indicating that growth hormone preparations can stimulate the ketone body production by liver slices.

The three sessions were ably presided over by G. Pincus, W. C. Stadie, and A. White.

R. I. Dorfman
The Worcester Foundation for Experimental Biology
E. D. Goldsmith
The College of Dentistry, New York University

Scientists in the News

Raymond DeLacy Adams has been appointed associate clinical professor of neurology at the Harvard Medical School and chief of the Neurological Service at Massachusetts General Hospital. He succeeds **Charles Soucek Kubik**, who will continue his neurological research and practice at the Hospital as lecturer on neuropathology.

Mount Sinai Hospital has promoted **Morris B. Bender** from associate neurologist to chief of the neurologic service. He has been at Mount Sinai since 1933, except for a research assignment at Yale in 1936–37 and service as a commander in the Navy Medical Corps in World War II. Dr. Bender is professor of clinical neurology at the New York University College of Medicine, head of its Laboratory of Experimental Neurology, and director of the New York University–Bellevue Medical Center's neurologic service.

Manson Benedict has been appointed technical assistant to the general manager to organize an operations analysis staff for the U. S. Atomic Energy Commission. Dr. Benedict is on leave from his position as professor of nuclear engineering at MIT for the period necessary to complete his assignment with the AEC.

Arthur H. Brayfield has been named head of the Department of Psychology at Kansas State College. Dr. Brayfield is now in Germany on a joint assignment for the U. S. Army and Columbia University.

C. Fraser Brockington, county medical officer of health, West Riding, Yorkshire, and lecturer in preventative medicine in the University of Leeds, has been appointed professor of social and preventative medicine, Manchester, to succeed **Andrew Topping**.

James Allan Campbell, assistant professor of medicine at the Illinois University College of Medicine since 1948, has been appointed dean of Albany Medical College. **R. S. Cunningham**, who has served as dean since 1937, will be given new responsibilities as executive director of the Albany Medical Center Council, a post to which he was appointed in May 1950.

Harold J. Coolidge, executive secretary of the Pacific Science Board of NRC, is representing the Pacific Science Association at the Filariasis and Elephantiasis Conference in Tahiti this month.

Aureal T. Cross, of the West Virginia Geological and Economic Survey, has made a comparative study of the remaining or available type material of Paleozoic plant microfossils in Europe. Fifteen museums, coal laboratories, and universities in England, Scotland, Wales, France, Belgium, Netherlands, and West Germany were included in his itinerary. Clarification of problems in identification and taxonomy of fossil spores and pollen and exchange of representative specimens were among the objectives of the trip, which was supported by a grant from the Penrose Fund by the Geological Society of America.

Loyal Davis, professor of surgery and chairman of the department at Northwestern University's Medical School, has been selected to give the Earl of Litchfield lecture at Oxford University next Oct. 10. He will speak on "The Physiological Principles Underlying the Treatment of High Diastolic Hypertension by Thiocyanates and Sympathectomy."

Margaret Denham, Helen Roberts and **Helen Bakhtiar**, nurse officers of the Public Health Service, have left for Indo-China and Iran, assigned to Economic Cooperation and Point IV health missions. Miss Denham and Miss Roberts are detailed to the ECA health mission headquarters in Saigon, and Mrs. Bakhtiar to Point IV mission headquarters in Tehran.

Columbia University has granted **Irwin Edman**, Johnsonian professor of philosophy, a leave of absence to permit his appointment as a Fulbright lecturer at the Sorbonne, the University of Aix-Marseille, and other institutions of higher learning in France.

Three medical research men have been appointed to the permanent staff of the Harvard Medical School: **Jordi Folch-Pi**, who becomes associate professor of biological chemistry at the McLean Hospital, will continue as chief of the biochemical laboratory there; **Nathan Bill Talbot**, who has been named associate professor of pediatrics at the Massachusetts General Hospital; and **Clinton Van Zandt Hawn**, of Cooperstown, N. Y., who has been appointed associate professor of pathology in the Harvard Medical School and pathologist-in-chief of Peter Bent Brigham Hospital. Dr. Hawn has been serving as assistant professor of pathology in the College of Physicians and Surgeons, Columbia University, as pathologist to the Mary Imogene Bassett Hospital, Cooperstown, N. Y., and as director of the Otsego County Laboratories. **Otto Krayer** is now professor of pharmacology and head of the Department of Pharmacology.

Gilbert J. Haeussler has been named leader of the Division of Truck Crop and Garden Insect Investigations, Bureau of Entomology and Plant Quarantine, USDA. **William H. White**, former leader of this Division, died March 14, 1951. Mr. Haeussler entered the Bureau of Entomology in 1925.

The retirement at 65 of **Frederick S. Hammen**, scientific director of the Lankenau Hospital Research Institute of Philadelphia, from active participation in the work of the Institute has been commemorated in *Growth* by statements of his part in the founding and development of the Institute, the journal *Growth*, the Growth Symposia, and the Society for the Study of Development and Growth, by Irene C. Diller, Stanley P. Reimann, Philip R. White, and Leigh Hoadley.

Five officials of the International Health Division of USPHS are making a study of the public health programs of the Special Technical and Economic

Missions in Southeast Asia established by ECA. They are **Howard M. Kline,** chief, Technical Missions Branch; **Virginia Arnold,** chief nurse; **R. W. McComas,** chief, Health Service Branch; **Donald J. Pletsch,** chief of SEA Technical Missions; and **Paul S. Heneshaw,** chief, Program Development Branch, who has been in India.

President Truman has accepted the resignation of **Katherine F. Lenroot** as chief of the Children's Bureau of the Federal Security Agency. As her successor, he nominated **Martha M. Eliot,** of Massachusetts, a former bureau official for twenty-five years. For the past two years Dr. Eliot has been an assistant director general of WHO at Geneva.

The Association for Jewish Children in Philadelphia has appointed as its executive director **Norman V. Lourie.** Since February 1947, Mr. Lourie has been director of the Hawthorne Cedar-Knolls School in Pleasantville, N. Y., maintained by the Jewish Board of Guardians for the care and treatment of emotionally disturbed children.

Marian MacAulay, formerly head nurse of the Research Ward at the Massachusetts General Hospital, Boston, has been appointed a member of the staff of the Oklahoma Medical Research Institute and director of nursing for the Oklahoma Medical Research Hospital. Miss MacAulay, who will also have an appointment in the University of Oklahoma Medical School, has been in charge of nursing on the Metabolic Research Ward at Massachusetts General for the past nine years. **Shirley L. Wells,** formerly research dietician at Massachusetts General Hospital, has also been appointed a member of the staff of the new Oklahoma institutions.

Malcolm A. Mason has been appointed to the new position of health educator in the preventive medicine division of the Air Force surgeon general's office. He will assist in planning, directing, and coordinating all USAF health education activities. Mr. Mason has been director of health education for the agriculture extension service at Purdue University.

F. Lloyd Mussells has been appointed deputy executive director of the Committee on Medical Sciences, Research and Development Board, succeeding **Thomas B. Spencer,** who became executive director of the committee on June 15. Dr. Mussells is on a two-year leave of absence from Strong Memorial Hospital, University of Rochester, where he has been assistant director for the past two years.

Maurice A. Schooley has been appointed head of the veterinary medical research department of the Research Division of Armour and Company. He has been in general veterinary practice at St. Joseph, Mo., and in the diagnostic laboratory of the North Carolina State Department of Agriculture. He also spent four years in the Army veterinary corps.

Allan Charles Scott, of Schenectady, N. Y., has been appointed head of the Biology Department at Colby College. Dr. Scott succeeds **Gordon Enoch Gates,** who resigned last month. He goes to Colby from Union College in Schenectady, where he has been a member of the biological staff for 15 years.

Sol Sherry has been appointed director of the May Institute for Medical Research of the Jewish Hospital Association and assistant professor in the Department of Internal Medicine of the University of Cincinnati Medical School. Dr. Sherry succeeds **I. Arthur Mirsky** (*Science,* **113,** 303 [1951]).

D. R. Shoults, director of engineering for Aro, Inc., of St. Louis, Mo., has been appointed director of the General Electric Company's aircraft nuclear propulsion project for the Air Force and Atomic Energy Commission. Headquarters of the project will be at the company's Lockland, Ohio, turbojet research, engineering, and manufacturing center.

Warren A. Sinsheimer, vice president of Petroleum Advisers, Inc., a Cities Service affiliate, has been appointed to the new office of petroleum economics coordinator. Under Mr. Sinsheimer's direction, broad economic studies within the petroleum industry will be made. Mr. Sinsheimer joined Cities Service in 1917 in the production and engineering department in Oklahoma.

I. Melville Stein has been elected to the newly created post of executive vice president of the Leeds & Northrup Company, Philadelphia. Mr. Stein has been a vice president, and is director of research. He joined Leeds & Northrup in January 1919. Mr. Stein is a fellow and former vice president of both the AAAS and the American Institute of Electrical Engineers.

Paul C. Tompkins has been appointed scientific director of the U. S. Naval Radiological Defense Laboratory, San Francisco, succeeding **William H. Sullivan** (*Science,* **114,** 140 [1951]). Dr. Tompkins went to USNRDL in 1949, first as scientific staff adviser, later becoming associate scientific director.

James Claude Thomson, recipient of a Fulbright lectureship in food and nutrition, will be at the Medical College of the University of Tehran and in the Ministry of Health of Iran for a nine-month period. He is on leave of absence from the University of Nanking, where he is professor of biochemistry and nutrition and head of the Department of Chemistry.

Education

Executive headquarters of the **Association for the Advancement of Instruction About Alcohol and Narcitics** will be at Yale, where the organization was formed during the 1951 Summer School of Alcohol Studies. Vashti Ishee, of the State Department of Education, Jackson, Miss., is the first president; J. Kenneth Ferrier, of Oregon, vice president; John L. Miller, of Wisconsin, secretary-treasurer; and Raymond G. McCarthy, of Yale, executive secretary. The

new association will serve as a clearinghouse for information and materials about the problems of alcoholism and drug addiction.

Robert H. Denison, curator of fossil fishes at **Chicago Natural History Museum,** is in charge of an expedition in New York, New Jersey, and Pennsylvania, which is seeking specimens of the fishlike vertebrate ostracoderm, one of the oldest known. Dr. Denison will also investigate the late Devonian rocks in western New York.

A new Center for Research and Training in Family Life will be opened at the **University of Chicago,** under the direction of Nelson N. Foote. Established with a fund of $80,000 from the Grant Foundation of New York City, the center will be open to students qualified to work for advanced degrees in the fields of family life education, parent-child relations, family and marriage counseling, family research, and teaching in these fields. Ernest W. Burgess, professor emeritus of sociology, will head a nine-member advisory committee, drawn from related fields, that will assist in the operation of the center.

Cosmic ray experts at **Cornell's Laboratory of Nuclear Studies** are making studies in a salt mine 2,000 feet below the surface for the Geophysics Research Division of the Air Force Research Center, Cambridge, Mass. The Cayuga Rock Salt Company mine near Ithaca is the subject of investigations of the relation between upper atmospheric conditions and cosmic ray intensity. The project is directed by Kenneth I. Greisen and Guiseppe Cocconi.

The **Department of State** has announced the appointment of five U. S. scientists to serve as scientific attachés in overseas posts: Hans T. Clarke, of Columbia University; William L. Doyle, of the University of Chicago; L. H. Farinholt, of Columbia University; Robert L. Loftness, a physical chemist from industry; and Louis Lek, formerly of the Scripps Institution. Dr. Clarke and Dr. Farinholt will assume responsibilities as science attachés in the embassy in London; Dr. Doyle and Dr. Loftness in the embassy in Stockholm; and Dr. Lek in the legation in Bern.

The Ministry of Agriculture of Venezuela has raised to the category of **Instituto Botánico** the former División de Botánica and has named Tobías Lasser director. The Biological Station of Rancho Grande, located in a subtropical forest, is part of the institute and is open to visiting scientists who may wish to do research in tropical biology. Information may be obtained from Dr. Lasser, P. O. Box 2156, Caracas.

In cooperation with the USDA, the **University of Minnesota** will try to find a way to improve exchange of agricultural publications by making a survey of agricultural research institutions in Latin America, followed by recommendations as to the most suitable depositories for the publications of various state experiment stations and of the department. Responsibility for initiating the new Point IV project rested with a committee composed of Harold Macy, chairman, R. D. Lewis, George F. Dow, and S. B. Freeborn. Ralph R. Shaw, USDA librarian, Glen T. Taggart, OFAR, and E. C. Elting, Office of Experiment Stations, cooperated with the committee.

Meetings and Elections

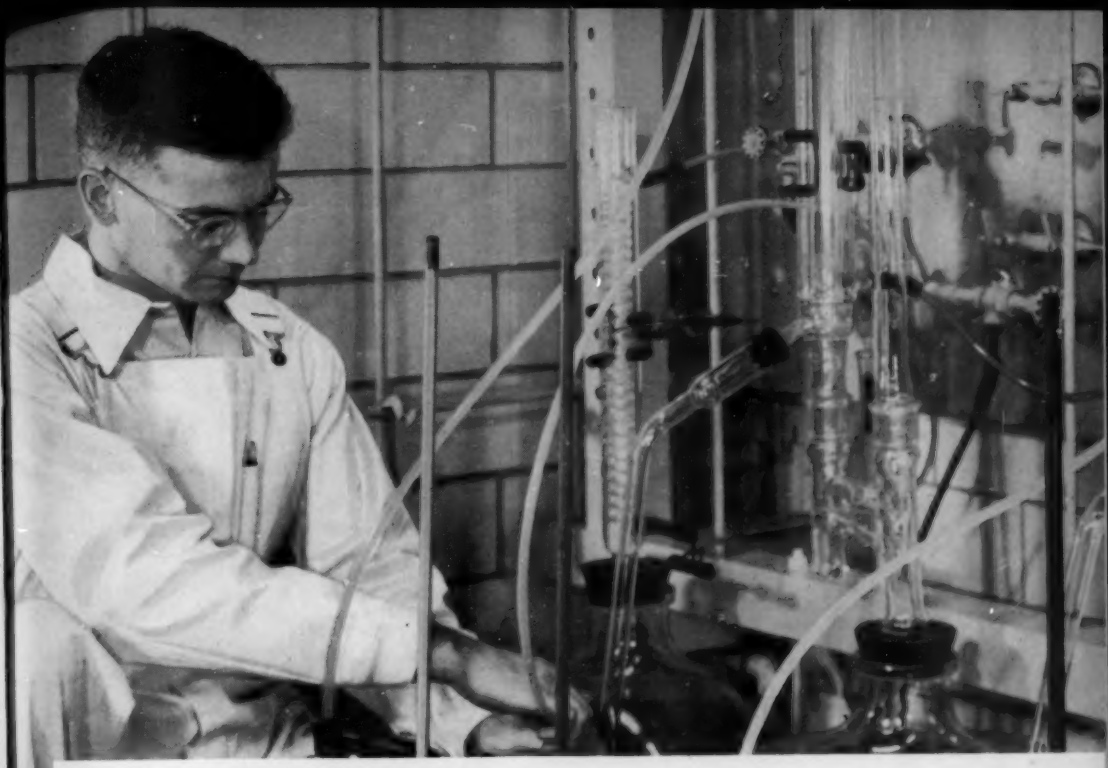
Taking advantage of the presence of scientists from all over the world at the Diamond Jubilee of the American Chemical Society, the Pulp and Paper Research Institute of Canada is organizing an **International Symposium on the Fundamental Chemistry of Cellulose and Lignin,** to be held in Montreal Sept. 24–26. A similar (but not duplicate) conference is being held at the Institute of Paper Chemistry in Appleton, Wis., during the preceding week.

Between 80 and 90 U. S. scientists are attending the ninth general assembly of the **International Union of Geodesy and Geophysics** at Brussels Aug. 21–Sept. 1. Heading the official U. S. delegation is Walter H. Bucher, of Columbia University, president of the American Geophysical Union. Other official delegates are K. Hilding Beij, National Bureau of Standards; Francis Birch, Harvard; Perry Byerly, University of California (Berkeley); Horace R. Byers, University of Chicago; L. P. Disney, U. S. Coast and Geodetic Survey; Waldo E. Smith, American Geophysical Union; F. J. Veihmeyer, University of California. Twenty-two other members of the group will officially represent the National Research Council.

J. Cloyd Miller, superintendent of schools in Deming, N. M., has been elected president of the **National Education Association.** F. L. Schlagle, superintendent of Kansas City, Kan., schools, was re-elected to the Board of Trustees, and Harvey E. Gayman, executive secretary, Pennsylvania State Education Association, was elected to the Executive Committee.

The semicentennial of the **Pacific Coast Entomological Society** will be celebrated at the California Academy of Sciences, Golden Gate Park, San Francisco, on Sept. 29. The program will include a lecture and motion picture by Elwood C. Zimmerman of the Hawaiian Sugar Planters Association Experiment Station on "The Origin, Development and Decay of Oceanic Islands." The anniversary will also serve as the occasion for introducing the society's new "Memoirs Series," the first volume of which, *The Sucking Lice,* is by G. F. Ferris and constitutes a comprehensive monograph of the Anoplura of the world.

In reporting out the Supplemental Appropriation Bill, 1952, on Aug. 17, the House Appropriations Committee cut the budget request of the **National Science Foundation** from $14,000,000 to $300,000—a sum barely sufficient for the simple needs of personnel and business operation. Obviously, without funds for the support of basic research and the training of scientific manpower, the foundation can merely go through meaningless motions of functioning.



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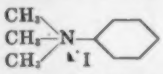

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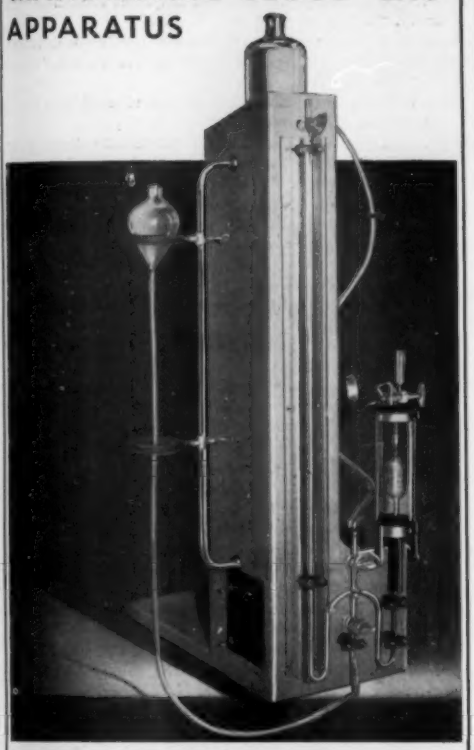

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Meetings & Conferences

Sept. 3–7. American Chemical Society (Annual). New York.
Sept. 4–8. American Congress of Physical Medicine (Annual). Shirley-Savoy Hotel, Denver.
Sept. 4–8. Second Alaskan Science Conference. Alaska Division, AAAS, and University of Alaska. Mt. McKinley National Park.
Sept. 5–7. Mycological Society of America. University of Minnesota, Minneapolis.
Sept. 5–7. National Agricultural Chemicals Association. Essex and Sussex Hotels, Spring Lake, N. J.
Sept. 6–8. American Physiological Society (Fall). University of Utah, Salt Lake City.
Sept. 7–9. Western Society of Electroencephalography (Annual). Olympia Hotel, Seattle.
Sept. 8–9. International Union of Pure and Applied Chemistry. New York.
Sept. 8–12. Ecological Society of America. University of Minnesota, Minneapolis.
Sept. 9–14. International Gerontological Congress. Hotel Jefferson, St. Louis.
Sept. 10–12. American Institute of Biological Sciences (Annual). University of Minnesota, Minneapolis.
Sept. 10–13. International College of Surgeons, U. S. and Canadian chapters (Annual). Civic Opera House and Palmer House, Chicago.
Sept. 10–13. International Congress of Pure and Applied Chemistry. New York.
Sept. 10–14. Instrument Society of America. Sam Houston Coliseum, Houston, Tex.
Sept. 12–14. American Fisheries Society (Annual). Rochester, New York.
Sept. 12–14. National Petroleum Association. Hotel Traymore, Atlantic City.
Sept. 13. World Metallurgical Congress. Detroit, Mich.
Sept. 13–15. American Society of Limnology and Oceanography (Annual). Rochester, N. Y.
Sept. 14–15. International Union of Pure and Applied Chemistry. Washington, D. C.
Sept. 16–20. Midwest Seminar of Dental Medicine (Annual). Baileys Harbor, Wis.
Sept. 17–20. American Hospital Association (Annual). St. Louis.
Sept. 17–21. Conference on Industrial Experimentation. Columbia University, N. Y.
Sept. 18. International Symposium on Chemistry of ACTH, sponsored by Armour and Company. Palmer House, Chicago.
Sept. 24–26. American Coke & Coal Chemicals Institute (Annual). Skytop Lodge, Skytop, Pa.
Sept. 24–29. German Chemical Society. Cologne.
Sept. 24–29. International Society of Surgery. Paris.
Sept. 24–29. International Association of Road Congresses. Lisbon.
Sept. 25–28. American Roentgen Ray Society. Washington, D. C.
Sept. 25–28. American Society of Mechanical Engineers (Fall). Hotel Radisson, Minneapolis.
Sept. 26–28. National Metal Trades Association. Palmer House, Chicago.
Sept. 29. Society for Clinical and Experimental Hypnosis (Annual). New York Academy of Sciences, New York.
Sept. 29–Oct. 5. American Society for Metals. Detroit, Mich.
Sept. 29–Oct. 5. American Welding Society. Detroit, Mich.

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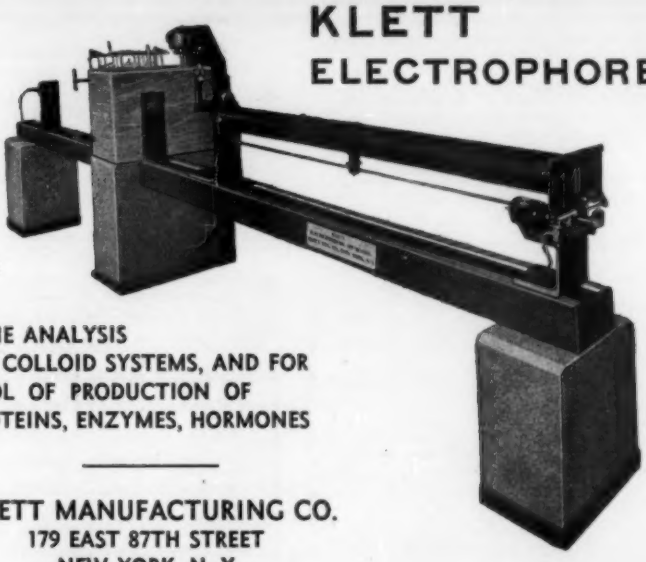

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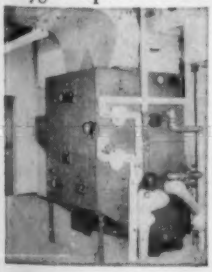

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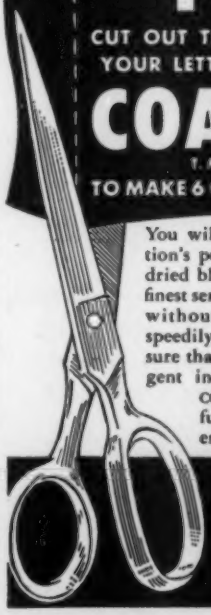

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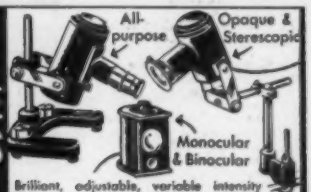

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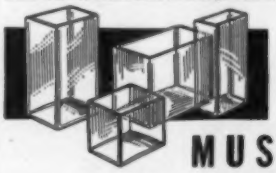

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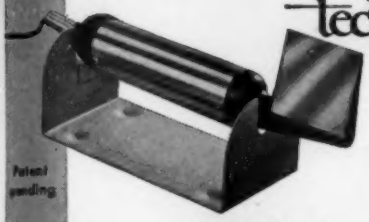

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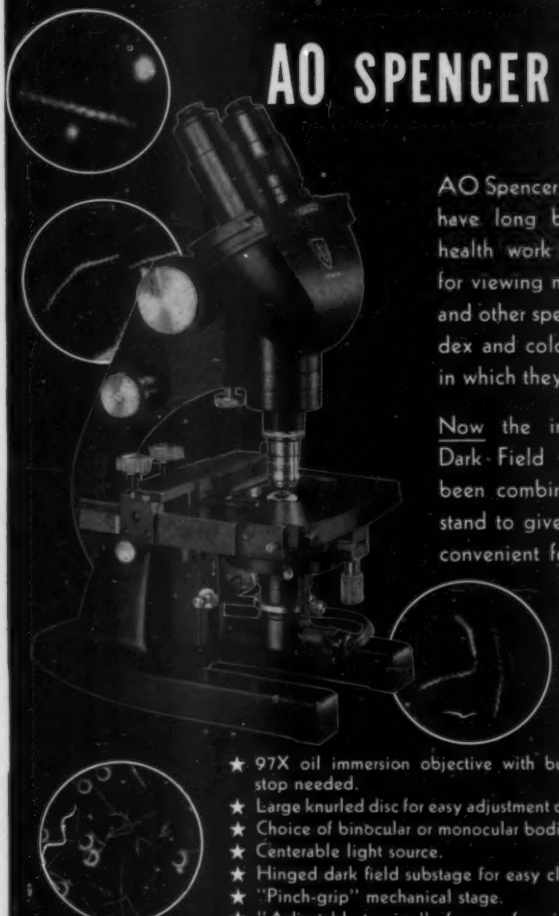

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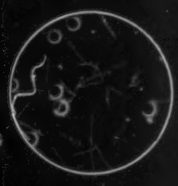

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